

MINING

CONGRESS JOURNAL



MARCH
1944



A
JOURNAL
for the
ENTIRE
MINING
INDUSTRY

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MINING
CONGRESS





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Corps and U. S. Navy
Photographs



AMERICAN MINING CONGRESS

Coal Mine War Conference

MAY 1-2, 1944

NETHERLAND PLAZA HOTEL • CINCINNATI, OHIO

MINING

CONGRESS JOURNAL

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TO BE FEATURED NEXT MONTH

The complete program
for the

1944 Coal Mine War Conference

Where executives, operating men
and equipment manufacturers
throughout the Nation will con-
sider means for meeting an all-
time peak in coal requirements,
and outline plans for the post-
Victory period.



Also timely discussions of

Future Tariff Policies
Stockpiling of Metals and Minerals
Liquid Fuels from Coal
Conserving Manpower by Preventing
Accidents
Prospects for Western Mining

LOOK FOR YOUR COPY

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PERMISSIBLE EXPLOSIVES

FOR EITHER MECHANICAL
OR HAND LOADING

THROUGH intensive research, chemical control, inspection and unremitting care in manufacture this list of permissibles has been designed to provide an explosive fitted to any seam of coal and for both hand and mechanical loading. There is a complete range of velocities and densities and in the list will be found one particularly adapted to your blasting problem.

AMERICAN explosives and AMERICAN electric blasting caps have proved their merits through years of service in representative coal mines. Through well located plants and distributing points prompt delivery service is assured.

NON-GELATINOUS

FAST	MEDIUM	SLOW
American 22	American 11	American 1
American 23	American 12	American 2
American 24	American 12A	American 3
American 25	American 14	American 4
American 26	American 14A	American 5
Genite A	Burton A	American 112

GELATINOUS

Permigel 1
Permigel 2A
Permigel 3

• Capable field engineers are available at your call.

American Cyanamid & Chemical Corporation



A Unit of American Cyanamid Company

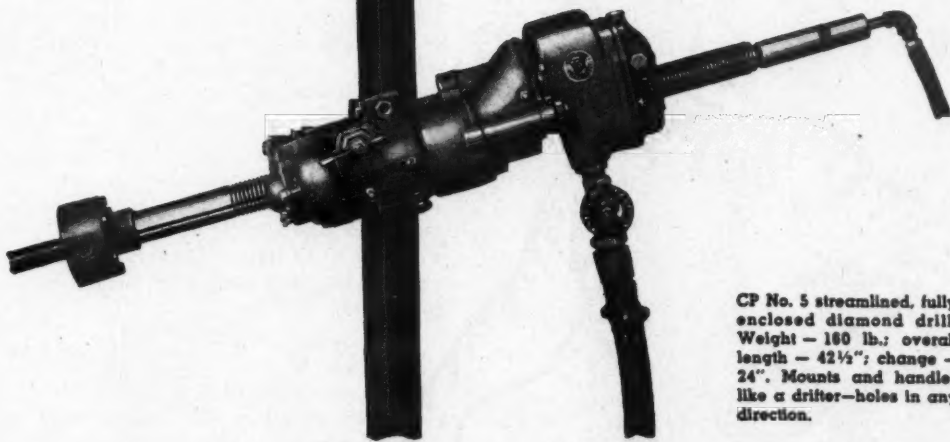
30 ROCKEFELLER PLAZA • NEW YORK, N. Y.

EXPLOSIVES DEPARTMENT

SALES OFFICES: Pittsburgh, Pa. Bluefield, West Va. Scranton, Pa. St. Louis, Mo. Chicago, Ill.
Pottsville, Pa. Hazleton, Pa. Maynard, Mass.

Blasthole Drilling with Diamond Drills

A RECENT TREND IN MINING PRACTICE



CP No. 5 streamlined, fully enclosed diamond drill. Weight - 160 lb.; overall length - 42½"; change - 24". Mounts and handles like a drifter-holes in any direction.

The idea is old, but it is only in recent years that marked developments in special, high-speed drills and bortz bits (of both coring and non-coring type) have brought footage per shift up and cost per foot of hole down to the point that this method of drilling is economical and practical. Blasthole mining, naturally, is most adaptable to large ore bodies where long holes materially reduce cost of development and stope layout; also it frequently makes for safer mining. Recently, however, forty to fifty foot blastholes have proven successful in breast stoping of comparatively narrow veins.

The CP No. 5 Diamond Drill, by reason of its powerful, vibration-less, vane type rotary motor, light weight (without recourse to the lighter metals), simplicity and ease of hand-

ling is rapidly becoming the standard Blast-hole Diamond Drill for mining companies (one company has 17) and diamond drill contractors throughout the world. Its power permits the use of non-coring bits, with the obvious attendant advantages, in fairly stiff ground. Where conditions are favorable to high bit speeds, pinion and gear combinations are available for 2000 and 2500 R.P.M. Standard speed is 1500 R.P.M. Stepless throttle regulation provides delicacy of bit control and flexibility from 0 to these maximum speeds.

Remember, also, that the CP No. 5 is equally suited to short hole prospecting to a depth of 500' with E rods and EX fittings.

With the CP No. 5 drilling is now easier, faster and cheaper than ever before. Write for copy of Bulletin No. 311.

★★★★★★★

PNEUMATIC TOOLS
ELECTRIC TOOLS
(Hicycle...Universal)
ROCK DRILLS

CHICAGO PNEUMATIC
TOOL COMPANY



General Offices: 8 East 44th Street, New York 17, N. Y.

★★★★★★★

AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES

**BOY! HAVE I
BEEN PLACES!**



**Tiger Brand has been scarce
on the home front . . . for
military reasons only**

BECAUSE we are the world's largest manufacturers of wire rope, it was logical for Uncle Sam to turn to us early for help in supplying the huge tonnages of wire rope needed for the war effort. To date, American Tiger Brand Wire Rope has been used in breath-taking quantities on every front.

As new and unusual service tasks had to be faced, our engineers produced the right wire rope to meet them. Our plants were kept running around the clock. Production facilities were expanded again and again to keep pace with war-time needs.

Now a growing amount of Tiger Brand is becoming available for use here at home. This wire rope incorporates all the improvements that war-stimulated advancement in rope-making technique provides. So, when you need rope—and want the best—get in touch with your Tiger Brand distributor.

*Excellay
Preformed*

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

COLUMBIA STEEL COMPANY

San Francisco

United States Steel Export Company, New York

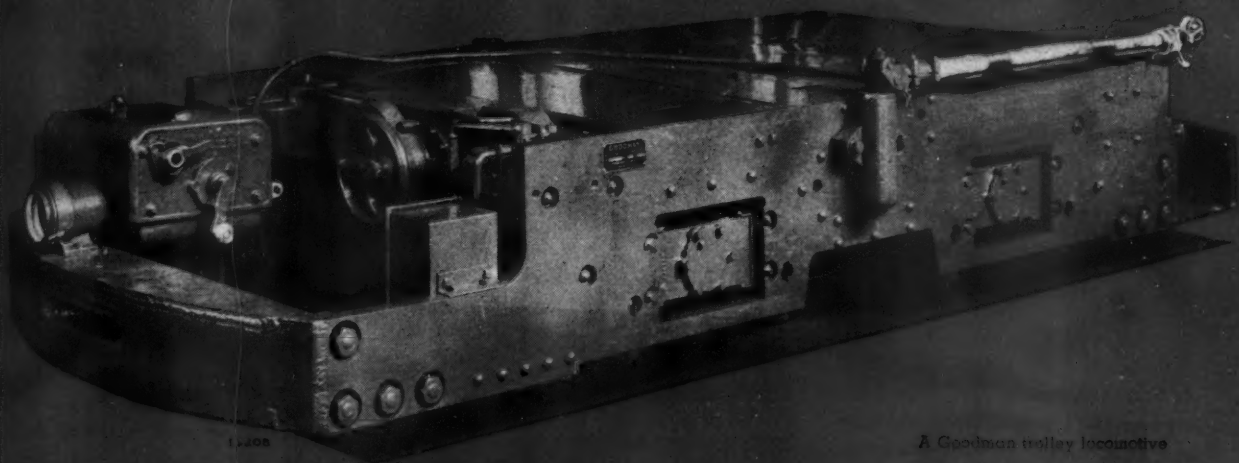


UNITED STATES STEEL



A GOODMAN LOCOMOTIVE

Will Meet Your Kind of Service



A Goodman trolley locomotive

- 8 tons, 2 motors
- 28 inch deck height
- roller bearing axle journals
- equalizers
- ample cab space for motorman

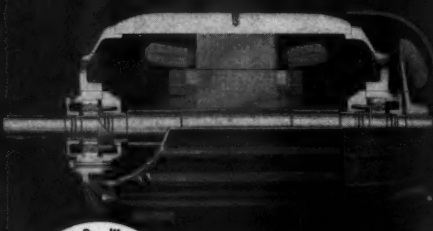
Low deck height—only 28 inches—without eliminating important features that promote efficiency and provide convenience for the operator. This is only one of many typical examples of Goodman locomotives built to meet a specific service or condition.



GOODMAN MANUFACTURING COMPANY
HALSTED STREET AT 48TH • CHICAGO 9, ILLINOIS

FOR

Sulphur & Sulphuric Acid Handling Plants
Rubber Mills
Cotton Mills & Gins
Lime Kilns
Sugar Refining
Aluminum Plants
Turpentine & Rosin Plants
Tanneries
Drug Manufacturing
Paint & Varnish Plants
Breweries
Ceramics Plants
Food Processing
Fertilizer Handling
Cement Mills
Oil and Fat Recovery
Flour Mills



SEALEDPOWER

(Cowl-cooled) available for all polyphase alternating current circuits, 2 to 15 horsepower. Write for detailed literature, or call our nearest office.

FOR

Wet Mines
Feed Mills
Coke Plants
Wood Working Mills
Textile Mills
Paper & Pulp Mills
Glass Manufacturing
Packing Plants
Laundries
Galvanizing & Pickling Processes
Dye Houses and Bleacheries
Soap Manufacturing
Crushing & Grinding Mills
Coal Tipples and Pulverizers
Foundries
Cement Mills
Grain Elevators, Etc.

Now a Corrosion-Resistant *SEALEDPOWER* Motor

PROTECTED AGAINST: acid fumes, alkali fumes, splashing or dripping corrosive liquids, air-borne moisture, steam, corrosive gases, conducting dusts, metallic chips, etc.

PROTECTED BY: a corrosion-resistant frame, cooled by a built-in corrosion-resistant fan. The windings are doubly protected from damage by Crocker-Wheeler's vacuum-impregnation process which seals each coil individually against moisture, fumes or dirt.

BRUTALLY TESTED! The seal's effectiveness is proved by laboratory tests (at right) and by hundreds of satisfactory installations.



1 SEALEDPOWER motor was placed in tank containing several inches of water and run continuously for 8 hours (see photo). It stood idle in water overnight, then was run 8 more hours. During motor's operation, the external ventilating fan drenched the outside of the frame with water. At end of test, the motor was disassembled and found to be completely dry inside.

2 A dense atmosphere of extremely fine French chalk was kept circulating around the motor and through its ventilating system for many hours. No trace of chalk was found inside upon disassembly.

JOSHUA HENDY IRON WORKS

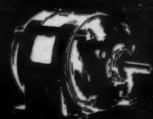
CROCKER-WHEELER DIVISION



ESTABLISHED 1856

AMPERE, NEW JERSEY

Branch Offices: BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND • DETROIT • NEW YORK • PHILADELPHIA • PITTSBURGH • SAN FRANCISCO • ST. LOUIS • WASHINGTON • LOS ANGELES



SQUIRREL CAGE MOTORS



WOUND ROTOR MOTORS



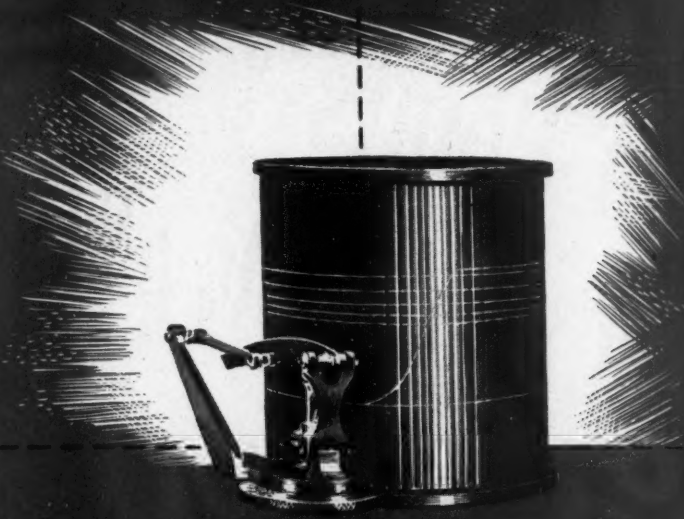
DIRECT CURRENT MOTORS



GENERATORS



FLEXIBLE COUPLINGS



DYNAMITE IN SLOW MOTION

TRANSLATING THE DETONATION of an explosive into a continuous line . . . and thus charting the exact rate at which pressure is developed is one of the tasks of the recording device pictured above. In effect, it produces a slow-motion picture of an explosion so that its characteristics may be accurately observed.

Through apparatus such as this in one of the most modern laboratories, Hercules technicians study the behavior of explosives of almost every type . . . and thus add to their background of knowledge. It is this wealth of experience—in research, in the field, and in manufacturing—that maintains a constant vigilance over the quality of Hercules explosives, for your benefit and ours.



HERCULES
EXPLOSIVES

HERCULES POWDER COMPANY
INCORPORATED

934 King Street
Wilmington 99 Delaware

Three Points to Consider in Selecting Trolley Wire Clamps

1 COLLECTOR CLEARANCE
Do clamp jaws allow free passage of collector without arcing and burning?

2 RECLAIMABILITY
Is design corrosion-proof? Can clamp be used over and over again?

3 HOLDING POWER
Does clamp deliver gripping power with high ultimate yet easily regulated to suit individual requirements?

GET PROPER BALANCE OF ALL THREE REQUIREMENTS WITH
O-B BULLDOG TROLLEY CLAMP
NO ONE FEATURE HIGHLIGHTED AT EXPENSE OF OTHER TWO

● Cross-section of an O-B Bulldog. Note how the head-nut automatically controls the opening and closing of the clamp jaws. Accurate threads, uniformly galvanized, give maximum protection against corrosion; faster, easy reclaimability.

Ohio Brass

MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

KEEP BUYING WAR BONDS



Exide
IRONCLAD
BATTERIES

...are an efficient and dependable source of power

The amazing success of America's wartime production lines has depended largely on a continuous supply of coal. In this swift, never-ending, ever-increasing movement of coal from "mine to line," powerful, rugged shuttle-cars have played a mighty important role and an efficient one. And in turn, their versatility and maneuverability is dependent upon quick starting and a continuous, uninterrupted source of power. That's why so many of them are equipped with Exide-Ironclad Batteries. Exides deliver all the power needed to meet every demand thus assuring a uniform working speed all day long.

More Exides are used underground than all other batteries combined. Their absolute dependability, long-life, and ease of maintenance is a guarantee of fewer service interruptions. When you buy an Exide, you *Buy to Last*. Take care of it and *Save to Win*.



THESE RULES OF BATTERY CONSERVATION HELP SAVE TO WIN

1. Keep adding approved water at regular intervals. Most local water is safe. Ask us if yours is safe.
2. Keep the top of the battery and battery container clean and dry at all times. This will assure maximum protection of the inner parts.
3. Keep the battery fully charged—but avoid excessive over-charge. A storage battery will last longer when charged at its proper voltage.
4. Record water additions, voltage, and gravity readings. Don't trust your memory. Write down a complete record of your battery's life history. Compare readings.

If you wish more detailed information, or have a special battery maintenance problem, don't hesitate to write to Exide. We want you to get the long-life built into every Exide Battery. Ask for booklet Form 1982.

THE ELECTRIC STORAGE BATTERY CO., Philadelphia 32
Exide Batteries of Canada, Limited, Toronto

Real Footage

round after round, month after month

WITH

CLEVELAND STOPERS



90-lb. Model 51
for standard
service



180-lb. Model 522
for extra heavy
work.

• A complete line—sizes for every class of work—both automatic and hand-rotating models. Extra powerful, well balanced, easy to handle—yet low in air consumption. Trip rotation and air feed relief—patented Cleveland features—insure extra convenience, greater safety. Large oil pockets for smooth, fast cutting and longer life. End seating valves—standard on Cleveland Stopers—increase in efficiency with use. All models available with any standard chuck size.

Write for Bulletins 127 and 129

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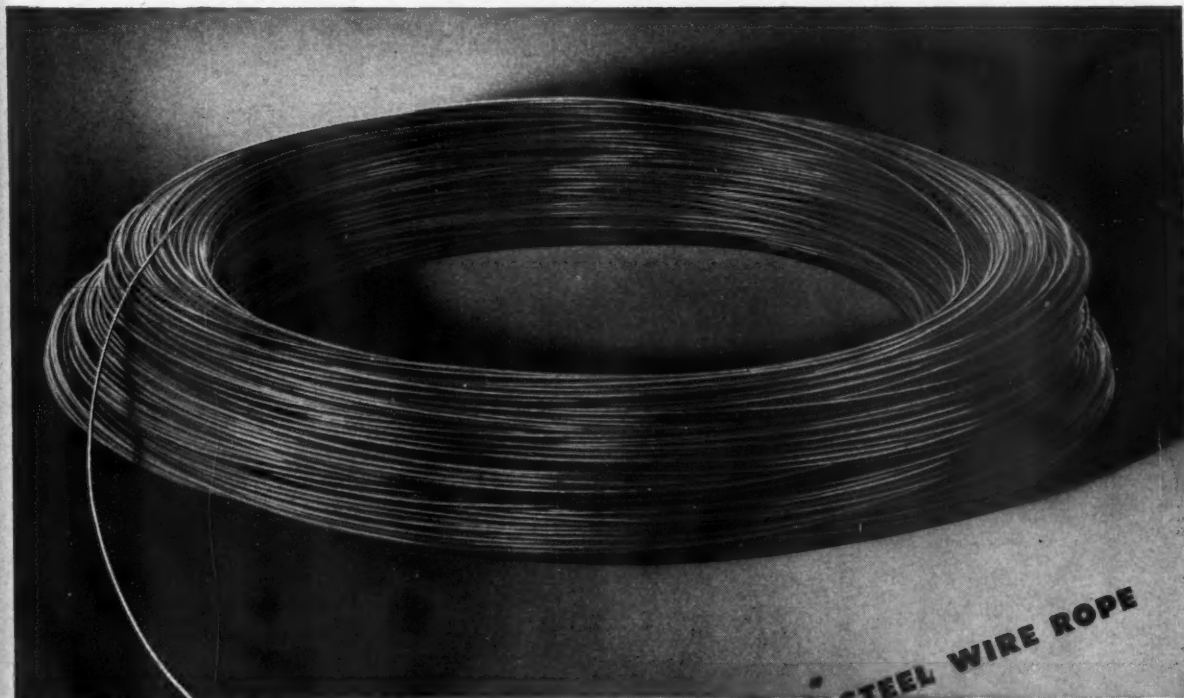
CANADIAN DISTRIBUTORS

Purves E. Ritchie & Son, Ltd.,
636 Hornby Street, Vancouver, B. C.

THE CLEVELAND ROCK DRILL COMPANY

Division of The Cleveland Pneumatic Tool Co. • CLEVELAND 5, OHIO

Wire rope can be no better than the individual wires that go into its construction . . . our open hearths, blooming mills, rod and wire mills are all dedicated to the production of specialized wire and wire alone



ROEBLING "Blue Center" STEEL WIRE ROPE



WHAT CAN YOU EXPECT from Roebling? Rope that has known capacity to deliver service. Engineering, in our plant and at your job, to put the rope to work right. Maintenance practices that protect its long life. » Your postwar profits and postwar jobs will depend in part on operating rope-rigged equipment at lowest cost. You can leave that part to Roebling.

JOHN A. ROEBLING'S SONS COMPANY, Trenton 2, New Jersey
Branches and Warehouses in Principal Cities



ROEBLING

PACEMAKER IN WIRE PRODUCTS

WIRE ROPE AND STRAND • FITTINGS • AERIAL WIRE ROPE SYSTEMS • COLD ROLLED STRIP • HIGH AND LOW CARBON ACID AND BASIC OPEN HEARTH STEELS • ROUND AND SHAPED WIRE • ELECTRICAL WIRES AND CABLES • WIRE CLOTH AND NETTING AIRCORD, SWAGED TERMINALS AND ASSEMBLIES • SUSPENSION BRIDGES AND CABLES

That more planes may fly

Today, endless caravans of giant trucks are rolling night and day all over the face of America . . . all dedicated to but one proposition: That more planes may fly . . . that more ships may come down the ways . . . that a nation may have everything it needs to fight—and win!

To perform this essential job . . . to make sure that it will be done in the minimum time and with the minimum cost in equipment, manpower and precious fuel stores . . . the country's biggest operators are using the power that, for more than a decade, has been setting the pace in economy, speed and dependability—*Cummins Diesel Power*.

So marked has been this trend to Cummins in the motor transport field that 90% of all long-line, heavy-duty, diesel-driven trucks are now Cummins-powered. Here is ample proof that major fleet owners have learned that the surest way to "get there fustest with the mostest" is to power with Cummins Dependable Diesels. CUMMINS ENGINE COMPANY, Columbus, Indiana.

This is the fifth in a series of advertisements depicting the war-time role of Cummins Diesel Power in the nation's basic industries. If you are operating Cummins Diesels on your job, make doubly sure of their most efficient use by providing for their proper maintenance and service. Ask your Cummins Dealer for details.





**JEFFREY
AERODYNAMIC
FANS & BLOWERS**

Jeffrey

**SERVES THE INDUSTRY
BELOW AND ABOVE GROUND
FROM FACE TO RAILROAD CAR**

**CUTTERS
DRILLS
LOADERS
LOCOMOTIVES
FANS
CONVEYORS
BLOWERS
JIGS
CRUSHERS
SCREENS
RENEWAL PARTS**

THE JEFFREY MANUFACTURING COMPANY

Established in 1877

912-99 NORTH FOURTH STREET, COLUMBUS 16, OHIO

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Birmingham
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Montreal, Quebec

British Jeffrey Diamond, Ltd.
Wakefield, England

Jeffrey-Gallen (Pty), Ltd.
Johannesburg, S. A.



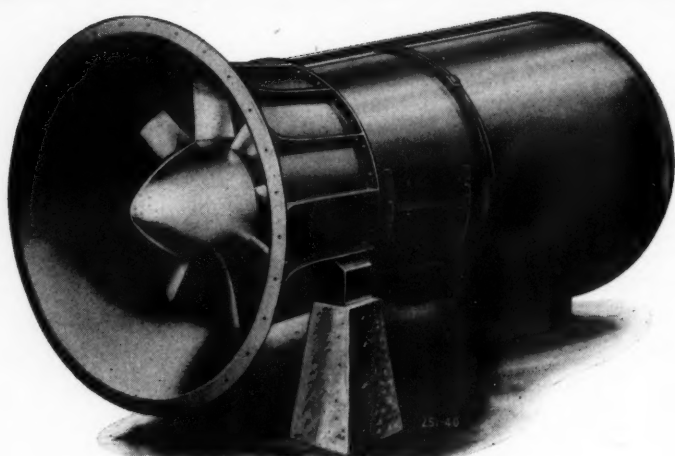
**Y
NE
ERS**

● Here is a typical installation of a type 8-H Aerodyne Mine Fan. This unit has a 117-inch rotor with adjustable pitch blades. Capacity 550,000 cubic feet at 9" W. G. 840 R. P. M. at 1000 B. H. P. Jeffrey has both the engineering staff and manufacturing organization to determine, design, build and install the proper ventilating equipment to provide safe, efficient underground ventilation. Bulletin No. 719 gives complete details as to models, capacities and operating efficiency.

30,000,000,000 cubic feet of fresh
air must be distributed below ground
for every shift of workers in U. S. Mines

JEFFREY FANS & BLOWERS

*Play an important part in
ventilating underground workings*



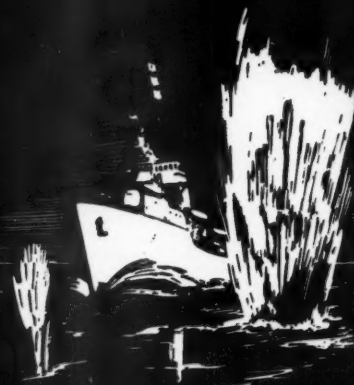
JEFFREY TYPE 8-H AERODYNE FAN

Provides maximum efficiency—safe working conditions—increased employee comfort—accelerated production—greater profit. It features high capacity, adjustable blades, slow speed, pressures up to 10 inches—will maintain high static efficiencies over a wide range of duties. (Patented.)



AERODYNE MIDGET TUBING BLOWER

A small, compact, lightweight, streamlined propeller-type unit of flame-proof construction. Used with flexible tubing for ventilating dead ends, single entries, etc. Ideal for use in conveyorized mines. (Patented) Bulletin No. 739.



4500 TONS OF COAL
ARE REQUIRED TO MAKE
STEEL FOR ONE DESTROYER

BUY WAR BONDS



PEACE WILL FIND MARIONS BUILDING A BETTER WORLD FROM THE NATION'S ROCK PILES



For more than half-a-century, MARION shovels have been called "Rock Shovels." This nickname has weathered several wars and still remains as an endorsement of MARIONS' powerful performance in heavy digging. This unchallenged reputation will serve them well during the trying years ahead when a better world will arise from the Nation's rock piles, with the aid of MARIONS.



THE MARION STEAM SHOVEL COMPANY • MARION, OHIO.



Offers

SHOVELS • CRANES
DRAGLINES • PULL-SHOVELS
CLAMSHELLS • WALKERS

*To Make Short Work of Every
Material Handling Job*

1/4 CU. YD. TO 35 CU. YDS.



**EASY TO LOAD . . . WATER RESISTANT
...ECONOMICAL TO USE**

*that's the **GELEX** story*



GELEX is a semi-gelatinous, high velocity dynamite that is constantly growing in popularity.

Stick for stick, Du Pont **GELEX** costs less than gelatins—yet in many cases it can be substituted for these more expensive grades. Like gelatins, **GELEX** is plastic and cohesive—making it easy to load even in slanting or vertical uppers. Furthermore, it has good water resistance, and detonates with high velocity, assuring good fragmentation.

GELEX in Perforated Cartridges eliminates raveling in uppers, and allows the charge to concentrate at the end of the hole where it will do the most good.

For complete details about **GELEX**,

talk with your Du Pont Explosives Department representative, or write E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington, Delaware

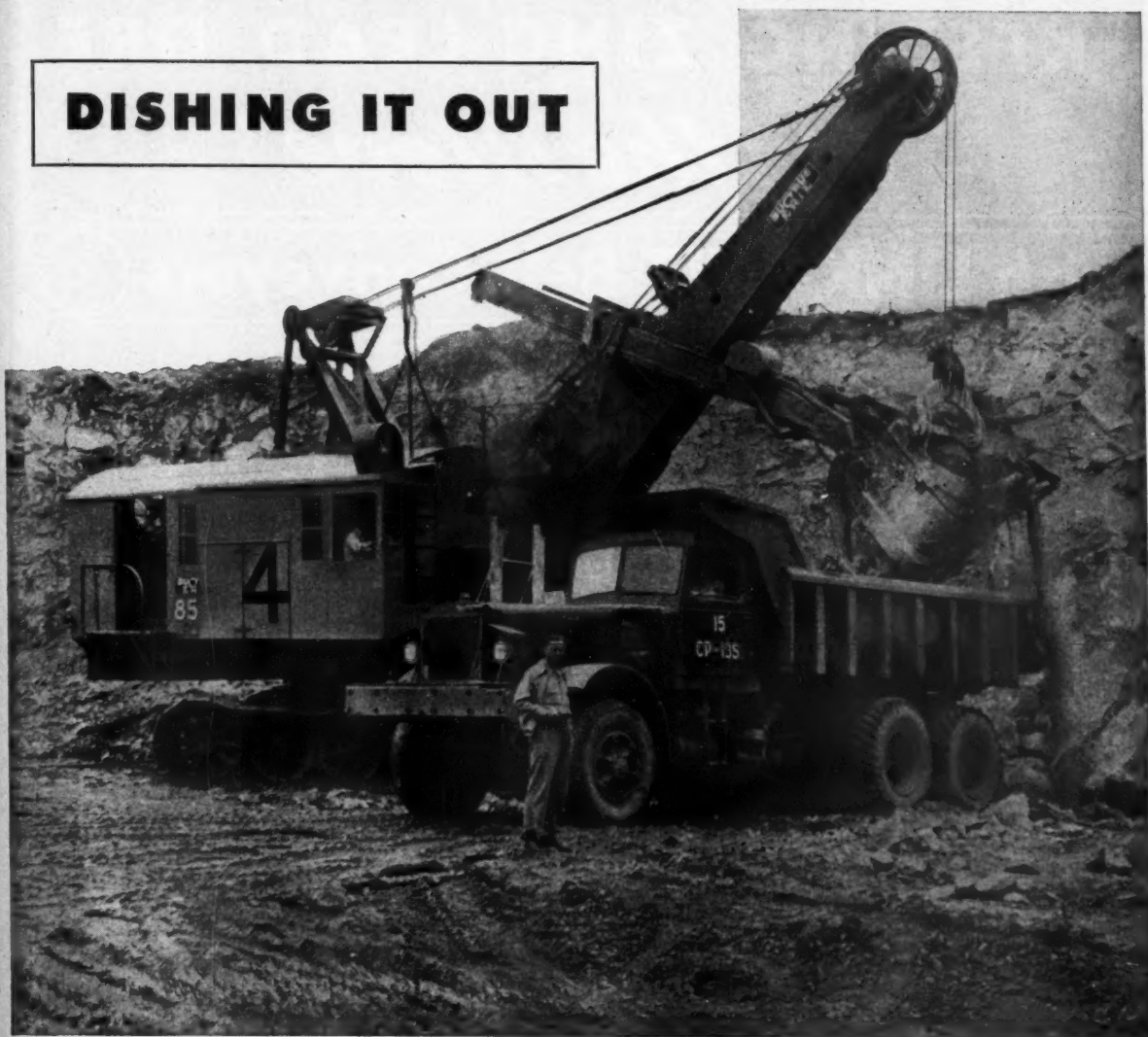


DU PONT EXPLOSIVES

BLASTING SUPPLIES AND ACCESSORIES

BUY ANOTHER WAR BOND TODAY

DISHING IT OUT



Better than most, mining men know that "Built like a Mack Truck" means built to take it and dish it out. Built to stand up under the smashing jar of heavy ore dropped from a 6-ton shovel, and to haul that ore out day after day after day. For 44 years, Macks have been built to work. They have been given the extra strength and ruggedness that work calls for . . . and these Mack qualities are paying off today in the way a Mack keeps working . . . on schedule and at lowest cost!



Mack

TRUCKS
FOR EVERY PURPOSE
ONE TON TO FORTY-FIVE TONS

BUY U. S. WAR BONDS



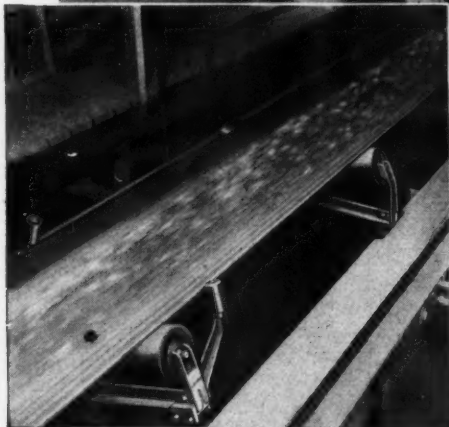
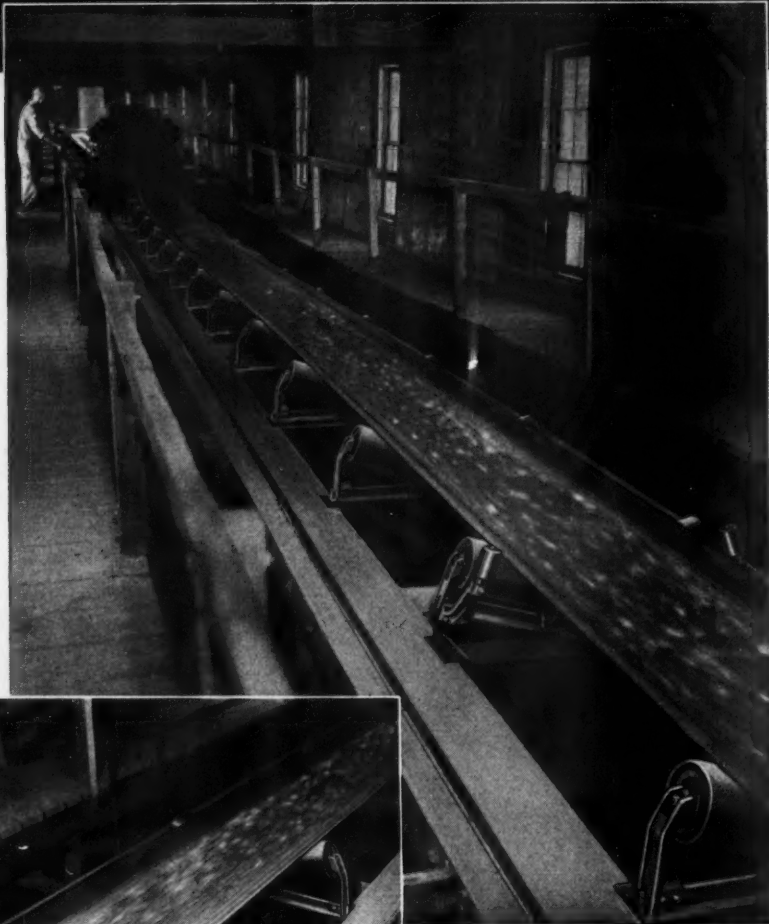
Mack Trucks, Inc., Empire State Building, New York, N. Y. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J. Factory branches and dealers in all principal cities for service and parts.

IF YOU'VE GOT A MACK, YOU'RE LUCKY . . . IF YOU PLAN TO GET ONE, YOU'RE WISE!

KEEPING ZINC-LEAD ORE

"On the Move"

with LINK-BELT Belt Conveyors



In foreground of this picture is shown a Link-Belt Series "100" Pivoted Self-Aligning Idler—one of a number of such idlers used on this installation—serving automatically to keep the conveyor belt in proper alignment, without exerting hard or continuous pressure on belt edges.

● To meet wartime requirements for critical metals, Golden Cycle Corp., operators of one of the largest gold recovery plants, have converted the flotation section of their custom gold mill to the production of lead and zinc concentrates.

In keeping the ore "on the move," belt conveyors perform a very important job. The illustrations show their 300-ft. long, 24" wide, Link-Belt Anti-Friction Belt Conveyor with automatic tripper for discharging the crushed ore into any of 25 storage bins, as desired.

Link-Belt pioneered in the development and manufacture of anti-friction belt conveyor idlers. Today, Link-Belt designs offer the best in belt conveyor equipment for handling a wide range of materials... to speed-up production for Victory.

LINK-BELT COMPANY

Chicago 9, Philadelphia 40, Pittsburgh 19, Wilkes-Barre, Huntington, W. Va., Denver 2,
Kansas City 6, Mo., Cleveland 12, Indianapolis 6, Detroit 4, St. Louis 1,
Seattle 4, Toronto 8, Vancouver

9357-D



Chicago Plants



Indianapolis Plants



Ordnance Plant

LINK-BELT
BELT CONVEYOR EQUIPMENT
IDLERS • TRIPPERS • BELTS • PULLEYS • BEARINGS • DRIVES



Mechanical Giants —with muscles of oil

Seabees and Army Engineers are putting bulldozers to work under conditions and on jobs nobody ever thought a machine could handle before the war. They whack out roads in dense Pacific jungles. Level landslides in Italy. Build landing fields on barren Aleutian Islands. Even wipe out Jap pillboxes with these mechanical giants.

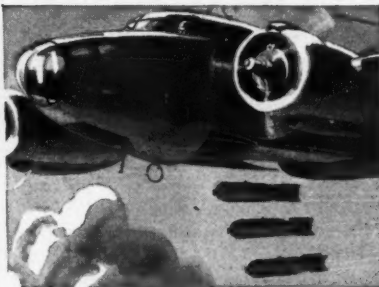
Earthmoving parts of bulldozers...like the working parts of so many modern machines...are operated hydraulically. They get their power through relatively slender hose that must be scientifically designed and built to withstand tremendous pressures, extreme changes of temperatures and to be able to flex without excess strain.

Scientific design is equally true of air hose, drilling hose, oil and gas hose...scores of different types of hose manufactured by United States Rubber Company. Many of them...like the hydraulic hose in bulldozers...are being subjected to new and unexpected strains and punishment in their wartime jobs. United States Rubber Company scientists are putting all their skill and ingenuity into improving the stamina and quality of U. S. Rubber Hose. The knowledge they are gaining now will be put to good use in peacetime applications.

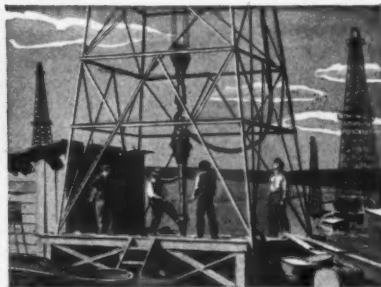
SERVING THROUGH SCIENCE



HOSE, specially engineered to handle extremely high pressures, furnishes the power for air-hammers and compressed air drills in mines and quarries the nation over.



"BOMBS AWAY"... and on target... mean that hydraulic machines have once again operated smoothly and efficiently. Bomb-bay doors and landing gear are only two of many places in fighting planes where hose is on the job.

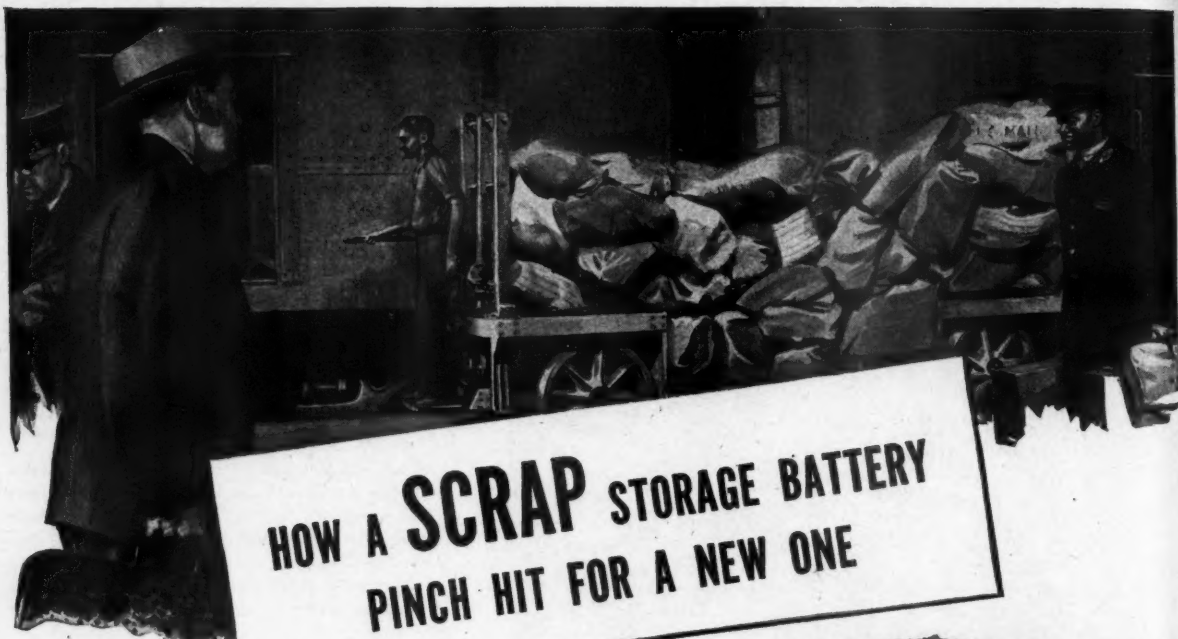


DRILLING HOSE, suction and discharge hose help keep vital petroleum flowing to the Armed Forces and to industry. Here again, hose must be scientifically designed, specially made for a specific task.

Listen to the Philharmonic Symphony program over the CBS network Sunday afternoon, 3:00 to 4:30 E.W.T. Carl Van Doren and a guest star present an interlude of historical significance.

UNITED STATES RUBBER COMPANY

1230 SIXTH AVENUE • ROCKEFELLER CENTER • NEW YORK 20, N. Y.



... A Salvage Story for Users of
Mine Locomotives and Shuttle Cars

A few years ago, an Edison Alkaline Battery, operating an industrial truck in a New England railroad terminal, was retired from service as "worn out." It had passed the usual "retirement age" and was beginning to show signs of no longer having adequate capacity for the work.

So the electrician in charge issued instructions to have it crated and shipped back to our factory for scrap credit. The battery was crated but in some unaccountable manner was not shipped. Instead, it was sidetracked into a corner of a dead storage room where it remained unnoticed for more than a year.

By lucky coincidence it was discovered again at a time when the terminal happened to be short of industrial-truck batteries. It was uncrated, charged, and put into one of the trucks just to see what it could do. It did so well that it was kept in regular use and was not finally replaced with a new one until more than a year later.

What this incident illustrates, more than anything else, is the fact that even after an alkaline battery reaches the normal end of its useful service life, and no longer delivers its full rated capacity, it is still a dependable power source, not in the habit of failing unexpectedly. Some of the unique characteristics of the Edison Alkaline Battery which account for this great reserve of dependability are cited in the column at the right.

**ADVANTAGES OF THE EDISON ALKALINE BATTERY
IN MINE LOCOMOTIVES AND SHUTTLE CARS**

- ★ It is durable mechanically. High strength steel construction is used in the containers, grids, pole pieces, etc. The electrolyte is a preservative of steel.
- ★ It is foolproof electrically. It may be accidentally short-circuited, over-charged, over-discharged, or even charged in the reverse direction without injury.
- ★ It can be charged rapidly. It does not require critical adjustment of charge rates and, therefore, can be charged directly from the d-c mine power supply. It has no finish-rate limitations. It requires no equalizing.
- ★ It withstands temperature extremes. It is not damaged by freezing. Free air spaces on all sides of all cells provide ventilation for rapid cooling under high temperature conditions.
- ★ It is simple to maintain. Merely charge adequately, add pure water, keep clean and dry.
- ★ Its tray assembly and cell connections are extremely simple.
- ★ Its life is so long that its annual depreciation cost is lower than that of any other type of storage battery.

EDISON STORAGE BATTERY DIVISION, THOMAS A. EDISON, INCORPORATED, WEST ORANGE, NEW JERSEY

Edison
ALKALINE BATTERIES

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Every Available Hand

FROM the beginning of the war enlistments in the Army, Navy, Marines and the Seabees have been heavy from our mining regions. Many young men have gone, even down to the age of 17 years, as the Navy and the Marines will accept able-bodied young men at 17 provided they have the consent of their parents or guardians. Despite the fact that many draft deferments have been granted at the mines, the young and agile personnel has been greatly reduced in numbers and today, at the call of the armed services, registrants are again being reclassified with particular attention directed to those under 26 years of age.

The laws of a number of states today permit the employment underground in mines of boys under 18. Specifically boys of 17 may be so employed in Texas and boys of 16 in Arkansas, California, Colorado, Illinois, Kansas, Kentucky, Maryland, Missouri, Montana, Nevada, New York, North Dakota, Oklahoma, Tennessee, Washington and Wyoming. It is also true that even boys of 14 may be employed in Idaho, Iowa, Minnesota and South Dakota, and no minimum is set in Maine, Massachusetts, Mississippi, Nebraska, New Hampshire and Oregon.

In our America of today, 16 is too early an age to put a boy underground, but it would seem by the very acceptance of enlistments of boys of 17 for the hazardous service of the Navy and Marine Corps that a sturdy, able boy 17 years of age is not too young to work underground, particularly on the haulage system as a brakeman or trip rider, signalman, or as a helper to an electrician or machine repairman.

Under authority granted in the Fair Labor Standards Act of 1938, the chief of the Children's Bureau of the U. S. Department of Labor on September 1, 1940, declared all occupations in or about any coal mine, except picking refuse, office work or working in repair shops, particularly hazardous for the employment of minors between 16 and 18 years of age.

Today the services of strong, able, alert boys of 17 are badly needed at the mines. Constituting slightly less than 1 per cent of the total population in mining states in the 1940 census, the number is not large, but their employment would help in this emergency. It does seem that the Department of Labor ruling should be eased for the duration of

the war. There is no need to fear that boys under 18 will be employed in mines after the war when there will again be a sufficient labor supply for production requirements.

Pass That Stockpile Bill!

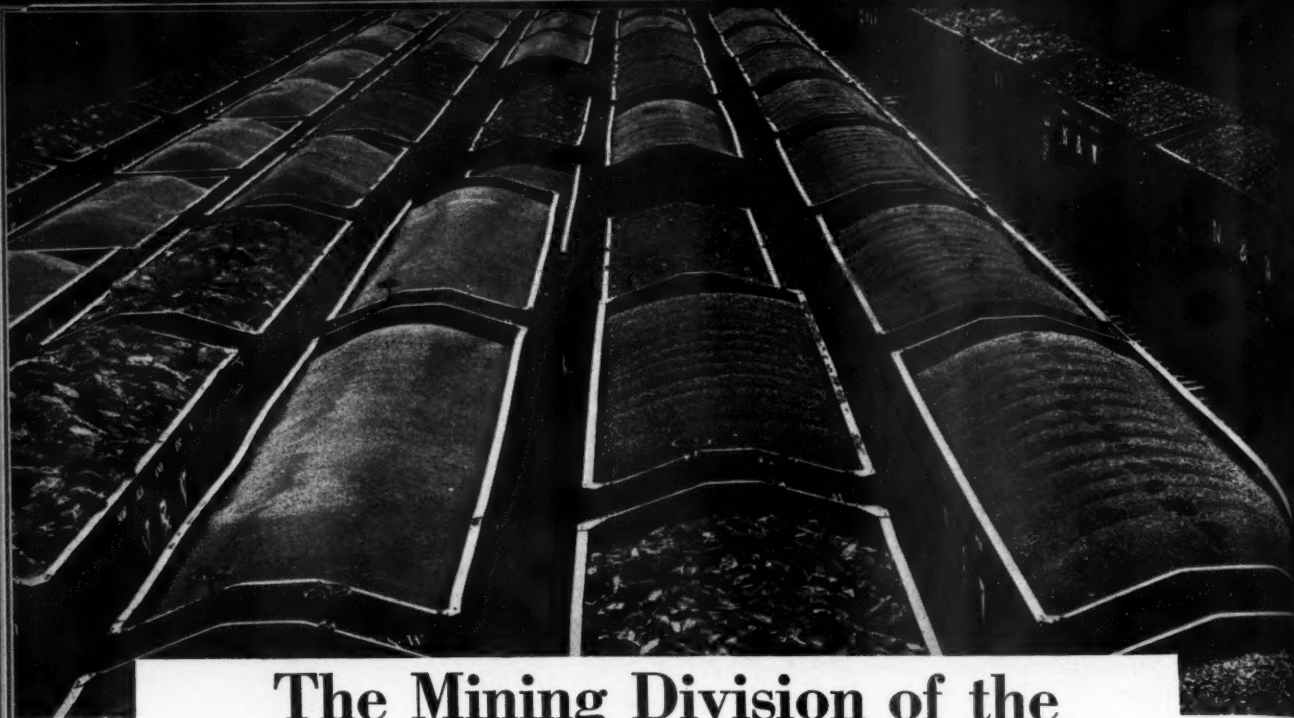
THE weeks and months are passing and we have the statement of one no less than Bernard Baruch that "anything can happen in Germany." In his report on "War and Post-War Adjustment Policies," Baruch reassuringly tells us not to feel "that precious surpluses will bear down upon us and destroy us; that vast amounts of metals, raw materials, ships and airplanes will smother us and engulf us." He assures us that these are assets of tremendous value, and we believe it. One of the functions of the Surplus Property Policy Board under the chairmanship of William L. Clayton is specifically to develop, in cooperation with the War Production Board, a policy for stockpiling both for the rest of the war and after, having in mind the problems of later disposal.

In this picture the mineral raw materials have particular significance. They are the very bone and sinew of modern mechanized warfare, without which a nation is powerless to defend itself. The providing of adequate supplies of these vital materials was one of our major worries in preparing our country to meet the Axis attack and to fight the war to a successful conclusion. Earlier efforts to create adequate stockpiles had brought only meager results, and we came near to paying a terrible penalty for our lack of foresight. This must never happen again.

At the close of this war our Government will have in its possession large stocks of most of the strategic and critical minerals; with commitments outstanding for large additional quantities. Substantial surpluses, in raw and semi-processed forms, will be found in private hands at mines, smelters, refineries and fabricating plants. Immense amounts of battlefield and industrial scrap will be returned for consumption. What better opportunity could possibly be offered to create permanent stockpiles of metals and minerals—converting all these surplus materials to the most suitable form, and setting them aside as insurance for our future national security?

Naturally the stockpiles thus initiated will vary in size and relative adequacy to the needs of a future emergency. Provision should be made to augment them to the extent considered necessary for national defense, with full consideration given to domestic producers in making such acquisitions.

Mineral stockpile legislation, including the Scrugham Bill, S.1582—has been under discussion in Congress for many months. The need of such legislation is obvious and clear-cut, and becomes more pressing as each day passes. Without it, many branches of the mining industry are threatened with a virtual black-out after the war, and the Nation loses a golden opportunity to provide for its future safety.



The Mining Division of the War Production Board

DURING the time between the signing of the Treaty of Versailles and the beginning of the recent hostilities in Europe, world civilization became more highly mechanized and more dependent upon the machine than at any time in the history of the earth. Hence, it was quite natural to expect that the war following this period of mechanized civilization would be one of mechanized combat—on the sea, in the air, and on land. Any type of mechanized civilization and its opposite, warfare, is dependent upon mineral raw materials and power as a means of developing this mechanization. The vast quantities of ships, planes, tanks, guns, and ammunition owe their entire existence to two fundamental factors, (a) mineral raw materials, and (b) manpower. In order that these machines may be put in operation a source of power is necessary.

At our present stage of development our essential power sources are dependent upon coal, petroleum, or water. Warfare places unusual burdens on the facilities for producing minerals from the earth's crust. Before the actual participation of the United States in the present conflict, it was evident that the requirements of these minerals could not be met at normal production levels and that there might be restrictions placed on

the distribution of these materials so that they would be diverted into the channels that were most directly effective toward the satisfactory completion of the war. It was evident that the United States and the Allied Nations would be required to supply vast quantities of metals, non-metallic minerals, and coal, that large numbers of new mines would have to be opened and that existing properties would have to be expanded at a rapid rate. To do this required the manufacture of maximum quantities of new mining machinery and of repair parts to maintain existing equipment in efficient operation. It was also evident that the distribution of this critical mining machinery must be controlled to such an extent that it would be placed in operation in those mines whose product was most essential for supplying the requirements of military matériel for the armed forces and to maintain essential civilian economy at a level compatible with the immediate military requirements.

The War Production Board and its predecessor organizations were established for the purpose of directing the economy of the United States to its greatest significance in the national emergency. The Mining Division of this Board was established for the purpose of seeing that adequate quantities and types of specialized mining



By **ARTHUR S. KNOIZEN**
Director

equipment were manufactured and that other types of machinery used in mining operations as well as in other industries, were also manufactured and made available for mining use. Furthermore, the Mining Division was given jurisdiction over the problem of distributing available supplies of all types of machinery, repair parts, and maintenance and operating supplies to those mines whose produce was essential to the war effort. In addition to the problems pertaining to the mining industry, the Division was given jurisdiction over similar problems pertaining to smelters. It was recognized that the United States would be called upon to produce machinery that would be used in mining

and smelter operations in various countries of the United Nations. The primary objective of the Division has been to maintain mineral production at an absolute maximum to meet the requirements of a world-wide highly mechanized war. It was evident that the mines and smelters required a great variety of equipment and materials and that all of these items could not be directly under the jurisdiction of any one Division. Hence, other Divisions of the War Production Board have played an extremely important part in the development and operation of the mining industry of the United States.

In order that mines could be classified on the basis of relative essentiality, a procedure for serializing mines which were essential to immediate military needs and essential civilian needs was developed. By this means the Division has been able to ascertain immediately where mining machinery could produce the most essential materials in the greatest quantities. Through this procedure the Division has been able to keep pace with fluctuating requirements of various types of minerals. Although there have been variations from time to time, the total number of serialized mines and smelters has been about 8,200, broken down approximately as follows: Metal mines 1,500, non-metallic mines 3,300, coal mines 3,400, and smelters 85. It was felt desirable to facilitate the discovery of new mining properties and hence a few serial numbers were issued to operators of core drills to enable these operators to obtain equipment and supplies as rapidly as possible. Although serial numbers were issued to the most essential mines, means were provided for maintaining production of many mines whose individual production was of no great significance but whose aggregate production could not be overlooked and which contributed a definite benefit to the war effort. Although it has been impossible to ascertain the exact number of these non-serialized mines, it is estimated that the number would be in terms of several thousand.

At this time it is impossible to give a detailed analysis of the value of the various individual types of mining equipment that has been used by the industry, but for the year 1943, priority assistance in one form or another was obtained by the Mining Division for about \$450,000,000 worth of maintenance, repair and capital equipment.

The Mine and Smelter Order

In the early days of the Division, it administered four Preference Rating Orders—Order P-56 for mines, Order P-56a for the manufacture of mining machinery, P-58 for certain South American copper mines, and P-73 for smelters. These orders were modified

and adjusted from time to time to meet the ever-fluctuating conditions of the vast industrial and military requirements of the United States and its Allies. Order P-56a was revoked and a scheduling order was established for the manufacture of mining machinery. Later the provisions of Orders P-58 and P-73 were combined with those of P-56 and that order was amended from time to time as conditions required. A mine operator wishing to obtain a serial number may submit his application to the Regional Technical Advisor for his territory. Upon receipt of this application it will be reviewed and an appropriate recommendation made to the Serial Number Unit in Washington. If the production of this mine is of sufficient significance in the war program, a serial number will be issued, whereupon application may be made to the Mining Division for obtaining a dollar value quota carrying an AA-1 preference rating for maintenance, repair, and operating supplies, an allotment number for obtaining controlled materials, and a quota for minor capital additions up to \$500 in value. Non-serialized mines are authorized to endorse an AA-5 rating for maintenance, repair, and operating supplies and to make specific applications to the Mining Division for controlled materials and such maintenance, repair, and operating supplies as are not obtainable with the AA-5 rating.

The order specifies certain restrictions on use and resale of material used in mine or smelter operations. The four conditions under which a producer operating under this order may sell used material, including machinery and equipment, are (1) to a producer holding a serial number hereunder, or (2) with the approval of the War Production Board applied for by letter to the Mining Division, or (3) with the written approval of a district if he is a non-serialized producer located within such district, or (4) as permitted by Priorities Regulation No. 13.

The restrictions on use and resale of equipment were established as a means of ascertaining that mining machinery would remain in use in mines that were of greatest importance to the war program, and that machinery which was no longer required for certain operations could be directed into other mines whose production was essential. At all times the Mining Division has attempted to relieve the industry from as much paper work as could consistently be done in keeping with existing circumstances. Therefore, the dollar value quotas were established, first on a quarterly basis and then on a semi-annual basis. Considerable progress has been made in the elimination of filing duplicate applications and it is believed that further progress along this line can be obtained.

Manufacturers of Mining Machinery

One of the important functions of the Division has been the administration of priority assistance to the manufacturers of mining machinery. During the year 1943, 275,000 tons of carbon steel, 74,000 tons of alloy steel, 12,000,000 pounds of copper and copper base alloys, and 46,500 pounds of aluminum have been directed into the fabrication of new machines and repair parts for existing equipment. Order L-269 provides the procedure for scheduling the production and delivery of this equipment. About \$95,000,000 of mining equipment and \$57,000,000 of repair parts have been turned out by those manufacturers producing equipment covered by this order. The Division has obtained priority ratings of AA-1 for the manufacture of coal mining machinery and 50 percent AA-2X and 50 percent AA-2 for the manufacture of the less critical metal and non-metallic mining machinery. A rating of AA-1 is assigned for the manufacture of all repair parts. These ratings place the manufacturers in a very favorable position with regard to their competitive status with direct military orders. Through the scheduling procedure, the Division is able to place new mining machinery in those mines where it will result in the maximum amount of production of the most critical materials and from the areas where these raw materials are most urgently needed. Delivery schedules are now being met with much greater accuracy.

During the early stages of the war there was an urgent demand for increase in metal production and a corresponding emphasis on the production of metal mining equipment. As direct military and essential civilian needs have been met, the demand for the expansion of metal production facilities tapered off and the demand for increased coal production became paramount. Therefore, the scheduling order has been very effective in guiding the flow of controlled materials into those types of machinery most urgently required.

As the armies of the United Nations advance further into European territory it becomes necessary to keep them supplied with adequate quantities of coal. These requirements can be met in only two ways: by mining coal in the United States and shipping it abroad, or by mining coal in England and the occupied countries. The transportation of this coal from the United States to Africa, Italy, or other European destinations would require enormous amounts of shipping space. Therefore, it has become necessary to resort to the other alternative, that of expanding coal production in England and the occupied countries. This can be done only by



Trucks, tractors and power shovels used in open-cut mines are also in demand in other war activities

mechanizing those mines to a greater extent than they have been heretofore.

The Mining Division has been called upon to provide equipment, particularly tractors, and power shovels for strip mines and locomotives, cutting machines, and loaders for underground mines. Problems pertaining to the production and delivery of this equipment have been complex. Domestic demands for coal have risen beyond any previous estimates and hence our own requirements of mining machinery have been greater. It has been necessary to provide equipment for the United Kingdom program without sacrificing domestic production. By wise scheduling, acquisition of used equipment, and the cooperation of the military services and various divisions of the War Production Board, equipment required will be forthcoming. It is not anticipated that this United Kingdom program will be detrimental to domestic operations.

The manufacturers of mining machinery are to be congratulated on the superior job they have performed and the excellent cooperation they have given this Division. Their record has been outstanding in that they have met all justified demands for new mining equipment and repair items for existing equipment. Furthermore, they are to be congratulated on the outstanding record they have made in the production of direct military matériel such as breach blocks, winches, ammunition hoists, five-inch loading machines, LST's, landing craft parts, machine tools, and many other assemblies required by the Army and the Navy.

Stripping Equipment

Machinery used in mining probably involves a greater variety than that of any other single industry. This diversification is so great that the types of machinery transcend all kinds of manufacturing facilities. Therefore, since this industry uses

equipment that is normally used by many other industries, it is impossible for the Mining Division to be the organization controlling the manufacture of all equipment used in strip mining. Three items will illustrate this point: trucks, tractors, and power shovels certainly cannot be classed solely as mining machinery, in fact, the mining industry would have a relatively small claim on the total output on these three items, particularly during war. These units are used predominantly in strip mines.

Because the manufacture of trucks, tractors, and power shovels has not been under the jurisdiction of the Mining Division, it has been necessary for that Division to work very closely with the Office of Defense Transportation, Automotive Division, and the Construction Machinery Division of the WPB. The Division has made estimates of the number of units and specifications of this equipment that will be required over a given period of time for the production of minerals. Under wartime conditions the military services are the major claimants for this heavy machinery and any units directed into channels other than military must be carefully and adequately justified. At no time has this equipment been allocated to the Division without the necessity for presenting a detailed statement of requirements and production of the mineral materials that will be obtained with it, and in many cases the allocations have not been as generous as would have been desired but at all times quantities necessary for minimum essential mining operations ultimately have been obtained. This stripping equipment is so critical and is in such great demand for direct military usage that it was found necessary to place very rigid restrictions on its acquisition. Operators, as defined under Order P-56, are prohibited from disposing of equipment except under the conditions set forth in that order.

Contractors working for a mine operator are not directly under the jurisdiction of Order P-56 and hence in the administration of this order the Mining Division has very little control over the use and disposition of equipment owned by contractors. There have been several instances in which a contractor has acquired a piece of equipment through priority assistance obtained from the Mining Division and at some later date this equipment has been removed from mining operations and used for some purpose other than mining. It has been found necessary for the Division to require an agreement between the mine operator and the contractor to the effect that the equipment purchased by the contractor will be used only in the mining operations of the producer or some other P-56 serialized producer except as may be specifically authorized in writing by the War Production Board on application by letter addressed to the Mining Division, Washington 25, D. C.

As the Division has administrative and moral responsibility for maintaining maximum military production from equipment allocated to it for distribution, it is necessary that all possible means be exercised to ascertain that this equipment remains in that use for which it was released. There are various procedures that can be followed by contractors and mine operators in order that the Division may be assured of the continued operation of stripping equipment in mining enterprises. All bona fide mine operators and mining contractors will recognize the justification of this restriction and will find that it works no serious hardship on the contractual agreements of the two parties.

Critical Items

It is evident that supplies of minerals are in much greater abundance at present than they were in the early part of 1943. Controlled materials can be delivered much more readily and in larger quantities than at any time during the war period. Certain fabricated items are more easily obtained and hence do not require as high a preference rating as they did some months ago. However, there are still enormous demands by military agencies for certain types of fabricated items and certain fabrication facilities. As the military requirements shift from time to time the relative criticalness of various items also shifts. Periodically, the following items have been critical: bearings, mining machine cable, mine timbers, tractors, power shovels, trucks, motor graders, compressors, and electrical equipment.

It is safe to say that the problems facing the mining industry, and hence the Mining Division, are not as numerous or as great now as they were in the past; heretofore these problems

have been solved and it is reasonable to suppose that solutions exist for current ones. The critical coal situation is well recognized and it is evident that its production must be maintained at a maximum.

The mining industry can be assured that the Mining Division will do its part in supplying important and justified requirements of the coal industry to meet its present urgent demands, but it must be recognized that the industry faces problems that are outside the jurisdiction of this Division; installation of equipment alone is not a panacea for production problems.

Gold Order

What is a gold mine? In an effort to define a gold mine it was immediately recognized that no definition could be devised that would present an accurate means of distinguishing between a gold mine and a mine producing base metals essential to the war effort, along with gold. Therefore, at the time Order L-208 was written, and the Mining Division was requested to administer it, no attempt was made categorically to define a gold mine. The term "non-essential mine" was used instead and each individual property from which gold was produced was carefully scrutinized with regard to the relative essentiality of its product in the war program. Order L-208 defines a non-essential mine and places restrictions on the operation of such mines.

The order also provides certain exceptions to these restrictions. Under the appeals clause an owner of a non-essential mine may appeal for exemption from the provisions of the order under certain conditions of undue hardship, etc. These appeals should be presented to the Mining Division and will be reviewed and analyzed and submitted to the Appeals Board of the War Production Board for official action. As labor and material become less critical, the restrictions of the order may be relaxed as much as is consistent with the best

interests of the war and with the demands for the use of this material and labor in more essential industries.

Field Offices

In addition to the staff of mining engineers and geologists in the Washington office of the Mining Division, there is maintained a field staff of about 21 regional technical advisors. These men are assigned to the regional and district offices of the War Production Board but are responsible directly to the Mining Division for their technical activities. The regional technical advisors for the Rocky Mountain and Pacific Coast states are under the immediate supervision of the deputy regional director for production in Denver, Colo. Each man has a specific territory for which he is responsible and performs many valuable duties that could not be covered adequately from the Washington office. Their service is particularly effective in assisting non-serialized mine operators in problems pertaining to the various application forms required by the War Production Board in making recommendations for release of equipment, expediting delivery of materials, and in making recommendations for serial numbers for those mines whose production is considered particularly essential for the war.

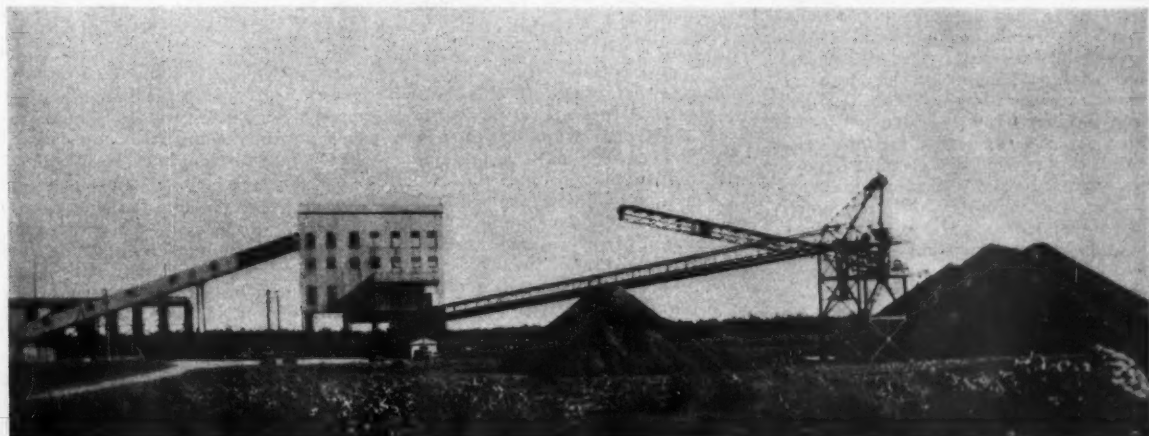
Plans for 1944

During 1944 the military requirements of mineral and metal production will fluctuate from time to time. Furthermore, there will be changes in civilian requirements of these materials and hence the entire production picture must change to meet these variations. However, it is evident that despite these fluctuations within the total production requirements, in general, maximum production of most materials must be maintained at a very high level. The administration of the orders and regulations of the Mining Division and other divisions of the War Production Board must be changed from time to time to meet

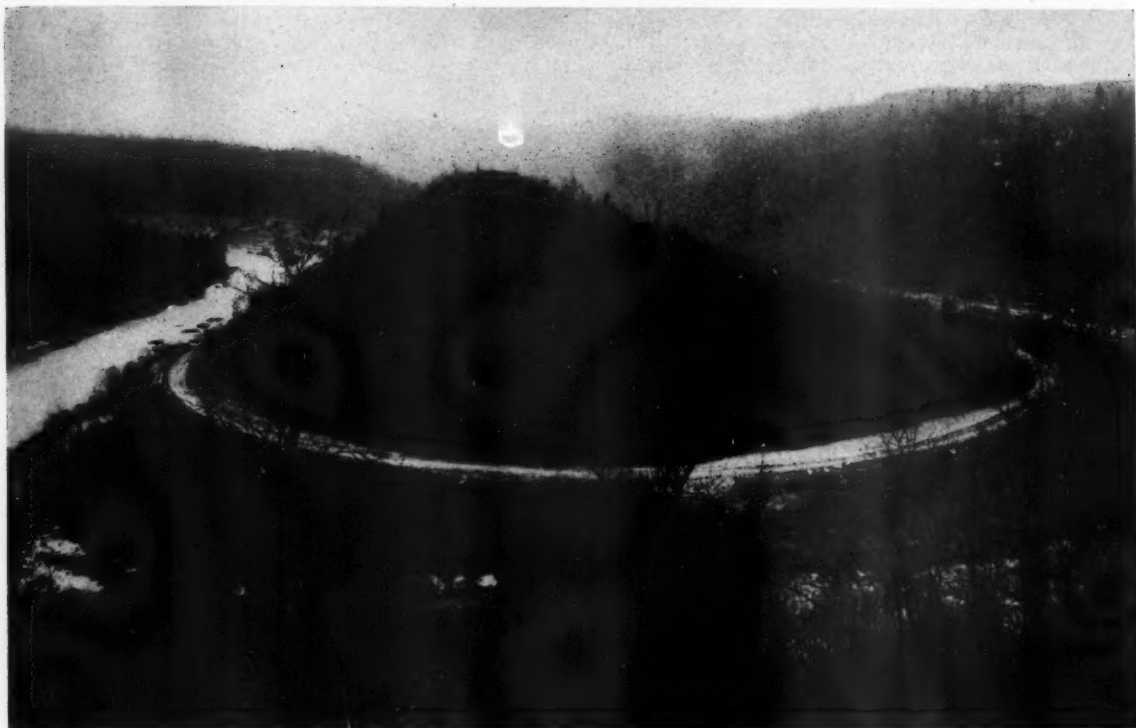
corresponding changes in requirements. The Division plans to make every effort to maintain its orders in keeping with existing conditions. Regardless of detailed production requirements, at present unknown, it can be stated quite safely that coal requirements will be extremely high. It is anticipated that the acquisition of controlled materials will become easier and that with few exceptions the acquisition of capital equipment will also become less difficult. It is contemplated that applications for capital equipment and for maintenance, repair, and operating supplies will continue to be handled in Washington. At all times the Division will direct its major activities toward providing means for obtaining equipment and other types of mining materials in sufficient quantities to enable mine operators to obtain the maximum amount of raw materials required for direct military consumption and for essential civilian requirements. It will make every effort to provide these materials with a minimum of restrictions and will attempt to eliminate filing applications, reports, and other forms as much as is consistent with adequate distribution of materials.

Acknowledgments

The members of the staff of the Division fully appreciate the wholehearted and effective cooperation it has been given by the manufacturers of mining machinery, by the operators of coal mines, metal mines and non-metallic mines, and by the operators of the smelters that have been under the jurisdiction of this Division. Without this cooperation the Division would have been under a serious handicap in its efforts to supply the equipment necessary to meet the requirements of the war for mineral raw materials. In addition to the cooperation given by the mining and smelting industry, the industry owes a great debt to our chairman, Mr. Donald Nelson, for guiding our industry through these very strenuous times.



A wide variety of mechanical equipment is required to keep raw materials moving through this Mesabi chief plant of the M. A. Hanna Co.



Typical view along Gauley River

A New West Virginia Coal Field

BENEATH the mountains of Webster and Nicholas Counties, West Virginia, geologists estimate there lies a reserve of approximately 12 billion tons of coal, much of it Sewell coal, and a large part of it recoverable with present-day mining methods. Inaccessibility to markets through lack of railroad or other haulage facilities has done more than anything else to prevent the rapid development of this coal field in the past. The Sewell and other allied seams located in these counties are medium volatile, low ash, low sulphur, and high fusion coals and make a very fine metallurgical coke. When used for steam purposes they are especially efficient in overloaded war industry steam plants, hence their value is already recognized in the leading markets and in the many plants engaged in essential war production.

This region is principally served by the Baltimore & Ohio Railroad with its West Virginia & Pittsburgh branch terminating at Richwood, W. Va. The former inaccessibility of this field has now been changed for this railroad has strengthened its bridges and re-

One of the few remaining fields of high quality coal is now being opened—new operations installed and others are projected.

By S. DUNLAP BRADY, JR.

Consulting Mining Engineer
Morgantown, W. Va.

habilitated its track on this branch in order to permit operation of heavy locomotives and 70-ton capacity coal cars. It has also built a large new yard and engine terminal at Cowen, W. Va., to provide for the increasing coal tonnage now developing, and the construction of several spur tracks up the various rivers to the tippie locations of the new mines will give service to the new operations.

The Monongahela West Penn Public Service Company has been extending its lines into the field and has improved its service. They have just completed the construction of an addition to their Rivesville, W. Va.,

power plant and have increased their generating capacity to 100,000 kw. as well as increasing the capacity of their transmission lines to this field.

So the last large undeveloped coal field in West Virginia is being tapped to answer the demand for greater national production of high grade coal in order to further the war effort. This region lies on the headwaters of the Gauley River and its tributaries in Nicholas and Webster Counties, West Virginia. It contains some 200,000 acres underlain with Sewell coal; and over 140,000 acres of No. 5 Block coal, Eagle coal, and other seams which are being opened principally

along the Strouds Creek & Muddlety Railroad, a tributary to the Baltimore & Ohio Railroad at Allingdale. In a general way this field lies in the center of the state of West Virginia and is bounded on the north by the Bergoo (Sewell) field of the Western Maryland Railroad Company, and on the south by the Greenbrier (Sewell) field on the Nicholas, Fayette, and Greenbrier Railroad, jointly owned by the New York Central and the Chesapeake & Ohio railroads.

The portion of the field, which is underlain with Sewell coal, has a very rugged terrain with very high mountains. Usually this seam lies at an elevation of from 250 to 400 ft. above the river valleys while the tops of the mountains are from 1,000 to 1,500 ft. above these valleys. These valleys are of sufficient width to provide plenty of level ground for town and plant sites which is contrary to most of southern West Virginia.

A great majority of this area is in the Monongahela National Forest and

has great scenic beauty. The Gauley River, with its tributaries, the Williams, Cranberry, and Cherry rivers, are on the most part typical mountain streams with pure water which make them good fishing streams as the small amount of water coming off the coal seams is very low in sulphur and not injurious to fish. The Conservation Commission of West Virginia along with the aid of the Forest Service, are stocking these streams with brook and rainbow trout and with bass in an endeavor to bring back the fine fishing formerly enjoyed here.

Land Ownership

In a triangle roughly formed by the Cherry River on the south, and by the Gauley River on the north and west, and with the apex at Curtin, where these two rivers come together, an area of about 250 square miles, or approximately 160,000 acres is underlain with Sewell coal extending to the headwaters of the Gauley, Williams, Cranberry and Cherry rivers. Today

substantially all of the coal in this area is owned by the Gauley Company with 130,000 acres, the Cherry River Boom and Lumber Company with 9,000 acres, the Fisher lands with 17,000 acres, and other smaller tracts. While outcrop investigation has proven the presence of the Sewell coal in minable thickness throughout most of the entire area, confirmation by diamond core drilling has largely been confined to the acreage nearest the Gauley River and in certain sections along the Williams River. At least 75 percent of the area remains to be drilled for the data necessary for proper mining development and a program has been set up by the Gauley Company for the complete drilling of their area which is now in progress.

Practically all the surface in this entire area belongs to the Federal Government and is part of the Monongahela National Forest under control of the National Forestry Service of the Department of Agriculture as a timber, game and fish preserve and



for general conservation purposes. The coal and other minerals are reserved to the original owners in the deeds conveying the surface to the Federal Government and the Government is required to permit mining and the use of as much of the surface as may be needed for the construction of plants, and for other mining purposes, together with the construction of whatever railroads are required for the proper mining development of the area.

In the territory north of the Gauley River and along the Elk River, but still considered within the confines of this field, the coal is largely owned by the Pardee-Curtin Lumber Company who have taken a leading part in the development of the Bergoo field of Sewell coal on the Western Maryland Railway.

In the lower reaches of the Gauley River, and south of the Cherry River below Curtin, ownership of both the surface and the underlying coal and other minerals is largely in the New Gauley Coal Corporation with its 30,000 acres, and the Gauley Coal Land Company which has extensive holdings to the south and west and particularly in the Greenbrier field on the N. F. & G. R. R. (C&O-NYC). Also on the south side of the Gauley River the Laing Alderson (Gaymont Fuel Company) interests with 6,000 acres have the largest individual ownership, while on the north side of the Gauley River there are smaller holdings. In this particular section the Sewell coal dips in a northwest direction and disappears a short distance north of the Gauley River, thinning out as it gets deeper under the surface.

In the northern and western side of Nicholas County and comprising the Muddlety Creek, Beaver Creek, and Strouds Creek watersheds, the commercial coals are the No. 5 Block, Coalburg, Peerless, No. 2 Gas, and Eagle and of these the No. 5 Block and Eagle are of prime importance. Except for large holdings of the Tioga Lumber Company, the Muddlety Coal Land Company, and the Elk River Coal & Lumber Company, most of the ownership is scattered amongst the various farmers now living on the numerous small tracts.

Coal Seams in the Nicholas-Webster Field

Sewell Seam. This seam is found to have an average thickness of 40 in. throughout this field and is a semi-smokeless, medium volatile coal, with low ash (around 3.4 percent), low sulphur (around 0.7 percent), phosphorous (slightly less than 0.01 percent), and high B.T.U. value (around 14,700). It is a free burning coal for general use and suitable for metallurgical purposes. It burns with a light gray smoke and is of hard enough struc-

ture to be favorably received as a domestic coal, having already replaced considerable anthracite in the Central West Markets.

Fire Creek Seam. This seam has been found to have minable thickness only around Bolair, where it is from 3 to 7 ft. thick in the pocket located at this point. It is a medium volatile coal with ash around 5 percent, low sulphur (around 0.7 percent), and high B.T.U. value (around 14,000).

No. 5 Block Seam. This seam, lying about 1,200 ft. above the Sewell in Nicholas County, is found in the hills of the northern and northwestern parts along the Beaver Creek and Muddlety Creek Valleys and along the Birch River. This seam is at tippie height on the headwaters of these streams but rises in the hills toward the mouths of the creeks. It varies in thickness from 4 to 10 ft., being nearly always multiple-bedded and the general practice in the field is to mine only the lower portion, which is very hard and splinty and averages 4 ft. in thickness where now mined.

This is a high volatile coal (around 36 percent), medium ash (around 6 percent), low sulphur (around 0.6 percent), and low phosphorous (around

Other Seams. Three other seams of minor importance, but of minable thickness, occur in this field, principally along Beaver, Muddlety and McMillion Creeks, and are the Coalburg, No. 2 Gas, and Peerless Seams.

The Coalburg Seam, found about 200 ft. below the No. 5 Block coal, varies in thickness from 2 to 10 ft., is a multiple-bedded seam, which where the thicker coal is found is generally split into several benches by heavy shale partings, most of the mining being done in the lower benches. It is a high volatile, low sulphur coal with varying ash content, due to the numerous slates in the seam.

The Peerless seam occurs about 200 ft. below the Coalburg coal and has minable thickness of 3 ft. along McMillion Creek where it is now being mined in a truck operation. It is high volatile, low sulphur, low ash, and medium fusion coal, and works with excellent results in household stokers.

The No. 2 gas coal occurs about 40 ft. below the Peerless seam and only shows minable thickness just north of Summersville on Muddlety Creek. At this point it is a soft gaseous coal about 4 ft. in thickness with



Tippie of Elk Lick Coal Co.

0.009 percent). It is an ideal coking coal and most of the output of this field is being used for gas production, with the resultant coke going for metallurgical purposes.

Eagle Seam. This seam, which occurs about 600 ft. below the No. 5 Block coal in this field, outcrops throughout the western part of Nicholas and is exposed along Muddlety Creek in the area north of Summersville, for about 6 miles only as the dip of the coal being northwest causes it to dip under this valley. This seam has a thickness from 4 to 5 ft. and is a hard structure coal with 3 in. of a cannel slate next to the sandstone roof. It is a good all purpose coal being high volatile (34 percent), low in ash (around 6 percent), low in sulphur (around 0.5 percent), and high in fusion temperature of ash (around 2,800).

two slate partings of 2 in. and 4 in., respectively.

Railroad Service

In the newly opened part of Nicholas and Webster counties, railroad service is being greatly improved. The northern and western section of Nicholas County, which contains the No. 5 Block and other coals mentioned in the previous paragraphs, is served by the Strouds Creek & Muddlety Railroad with a connection with the Baltimore & Ohio Railroad at Allingdale. At its western end it connects with the Birch Valley Lumber Company's railroad which follows Muddlety Creek to near Summersville; permission has been granted by the Interstate Commerce Commission to rehabilitate and extend this road so as to give service to this valley.

The upper Gauley River area is served by the Baltimore & Ohio under an agreement with the Cherry River Boom & Lumber Company R.R. Present connection is at Allingdale but work is in progress on a new connection from Donaldson to Cowen which will result in considerable saving of distance and will facilitate the handling of traffic from the mines being located in the Williams River Valley.

On the southern edge of this field the B. & O. has built a 6-mile extension down the Gauley River from Curtin, for the purpose of opening the lower region of the Gauley Sewell field and these extensions are now in operation.

On the extreme southern edge of this field and adjacent to the Greenbrier field, the Nicholas, Fayette and Greenbrier R. R., jointly owned by the New York Central and the Chesapeake & Ohio, has just constructed an extension from Quinwood 5.6 miles long to serve this edge of the field. This extension is now in operation and plans are being made for further extensions into the Hominy Creek area by this railroad.

Economic Possibilities

The main source of Sewell coal for many years has been in Fayette and Raleigh counties, West Virginia, and now these areas have passed their peak production with their output probably dropping sharply, in the near future. This condition undoubtedly influenced the Chesapeake & Ohio Railroad in opening up the Greenbrier field in 1921, followed later by the construction and subsequent extensions jointly with the New York Central. The production of the Greenbrier field has been, in recent years, running about 2,000,000 tons per year, and ample reserves are available to continue this production for another 15 years or more, but no increased production is anticipated from this source.

The Western Maryland Railroad in conjunction with the Pardee-Curtin Lumber Company opened up the Bergamo field in 1927; this output has found a ready market principally in the East, and during the depression years showed no decline. Production from this region during recent years has been around 2,000,000 tons per year and since this field has been intensively developed will only be able to maintain this production in the future.

This situation has led to the investigations in the Nicholas-Webster area on the Baltimore & Ohio Railroad and its connections in the last few years and to the opening up of this field as the investigations showed that this coal was equal in quality to that now being produced in the older operations. The greatly increased demand for this grade of coal in the war industries has



Sewell Coal and Coke Company on Cherry River

also hastened the necessity for prompt development. The production from all seams in this field (mostly Sewell coal) has increased from 110,000 tons in 1940, to around 1,000,000 tons in 1943, and the new mines being installed are just beginning to produce.

Present Mining Activities and Leases

The Elk Lick Coal Company is operating on a lease of 4,500 acres of Sewell coal and began operations in 1933. They are now in full production from their No. 2 and No. 3 mines, located near Jerryville, on the headwaters of the Gauley River, about 12 miles up the Gauley River from Bolair, W. Va., on the Cherry River Boom & Lumber Company's railroad and are producing 2,000 tons per day.

The Kessler Coal Company, operating on a lease of 350 acres of Sewell coal, began operations in June of 1943, and are now loading 200 tons per day. This mine is located 3 miles up the Gauley River from Bolair on the C. R. B. & L. R. R. It is planned to increase production to 500 tons per day as soon as possible.

The Pardee-Curtin Lumber Company in April, 1943, opened the Bolair mine in the Fire Creek coal, their own property, and are now producing 900 tons per day in a completely mechanical mine. Bolair is 4 miles south of Webster Springs, on the C. R. B. & L. R. R.

The Sewell Coal & Coke Company is operating the Cherry River No. 2 mine in Sewell coal near the mouth of Cherry River on a 700-acre lease near Curtin. This mine was opened in



Four grades of coal loaded

August, 1943, and is now producing 200 tons per day and is expected to increase its production to 700 tons per day with the installation of a conveyor system of mining.

The Woolridge Coal Mining Company has a 1,000-acre lease and is operating the Sewell Chief mine in the Sewell coal at the mouth of Taylor Run on the new extension of the Baltimore & Ohio Railroad 3 miles below Curtin, on the lower Gauley River. The present production is 300 tons per day and plans have been made to increase this to 1,000 tons per day.

Mount Hope Coal Company, operating a lease of 1,500 acres in the Sewell coal near Holcomb, on the Cherry River, have just commenced to develop their main entries and are producing 100 tons per day. Plans are for this mine to produce 750 tons per day in the near future.

Donegan Coal & Coke Company is operating on a 5,000-acre lease in Sewell coal. They are now producing 150 tons of coke per day from the beehive ovens located on this lease and expect to commence shipping a large tonnage of coal in the near future. This property is on Laurel Creek, 2 miles south of Fenwick, on the Cherry River.

Imperial Smokeless Coal Corporation has a lease of 5,000 acres of Sewell coal on Colts Branch of Hominy Creek 5 miles north of Quinwood, and are now producing 700 tons per day. This coal is being loaded on a branch of the N. F. & G. Railroad which has just been completed. It is planned to bring this mine to a production of 1,500 tons per day as soon as possible.

Panther Coal Company have opened the Panther No. 5 mine at the mouth of Little Laurel Creek on Gauley River about 5 miles down river from Curtin, on the new B. & O. extension. They have a lease of 4,000 acres of Sewell coal and having opened with the use of conveyors are up to a production of 500 tons per day after two month's operation. It is expected to produce 3,000 tons per day when full production is attained at this mine.

Johnstown Coal & Coke Company

have just made a lease of 4,000 acres of Sewell coal on Panther Creek and are expected to install a mine of 3,000 tons capacity daily as soon as a spur track is constructed up Panther Creek from the Gauley River extension of the B. & O. Railroad.

Richwood-Sewell Coal Company has made a lease of 1,500 acres on the north side of Gauley River and expect to be in production soon at the rate of 1,000 tons per day.

The Tioga Coal Corporation, one of the pioneers of the No. 5 Block coal in this field, have been mining near Tioga, on the S. C. & M. Railroad for

loading into mine cars at the Elk Lick Coal Company where the Sewell has the unusual height of 60 in., to the complete conveyor system at the Nicholas-Webster Coal Company, where the coal is conveyed from the face to the railroad car by chain conveyors and belts. Most of the operators installing mines in the Sewell coal expect to use conveyors either with mine cars or with belts to the outside as this coal lends itself to this method because of its average 40 in. thickness.

The Pardee-Curtin Lumber Com-



New opening in Fire Creek seam, Pardee and Curtin Lumber Co.

some years and are now producing 900 tons per day and they expect to double their production in the near future. They are operating on a 8,000-acre lease from the Tioga Lumber Company.

The Nicholas-Webster Coal Company are operating the Tioga No. 5 mine in the No. 5 Block coal in a 500-acre lease located at the head of Muddlety Creek on the S. C. & M. Railroad and are producing 500 tons per day.

Methods of Mining

The mining methods being used in this field range, from mobile loaders

pany at their Bolair mine are using mobile loaders at the face and loading into rubber-tired shuttle cars, which in turn discharge the coal onto a belt conveyor installed in the main entries. The belt conveys the coal to the drift mouth and then by a rope swinging bridge crosses the highway and the Gauley River to the tippie.

It is to be expected that many new innovations in mining coal will be installed in this field as its development has only just begun, and the eyes of the coal industry will be upon it from now on.

Multipore Filter a Development of U. S. Rubber

MULTIPORE, a rubber filter material containing as many as 6,400 perforations to the square inch, is now being used by coal and iron mines, steel mills, and other types of industry.

Multipore may be traced back 18 years when chemists were pioneering waterproofing raincoat fabric. Pinholes almost microscopic in size mysteriously appeared after the fabric had been heated. Pockets of air were being trapped within the mesh of the

material. When heated they exploded through the film of latex that had been spread on the fabric.

A remedy was found, whereupon scientists reversed their findings to see just how many holes they could create in a square inch of latex film. They succeeded in blowing as many as 6,400 holes to the square inch, in sheets up to 42 inches wide and 20 yards long. Latex is now spread on a cured rubber blanket containing the desired number of nearly microscopic

pits uniformly distributed. When this is heated the air trapped in each pit is expanded and blows a hole through the latex film.

In soft coal mines, coal dust formerly lost, is recovered from processing water, increasing production from 200 to 300 tons per day at individual mines.

A steel company installed the first multipore filter in the flotation process of separating iron ore. Where fine, sharp particles of ore are separated, conventional filter material lasts only a week. Multipore filter showed no signs of wear at the end of a month.

Role of Heavy Metals

In Postwar Economy

THE United States has reached its wartime goal in the construction of plants, the expansion of mining, and in the actual production of metals. We may well feel proud that in one year of preparation and two years of war we have achieved a production mark far beyond the enemy's maximum which required more than 10 years and the conquest of most of Europe. The war is not yet won and consideration of post-war problems must be premised on certain assumptions that we feel reasonably certain will be realized. Among these are:

(1) The United Nations will win the war, and the end of hostilities, while not necessarily even in Europe in 1944, will be in the not too distant future.

(2) The peace terms and International developments resulting therefrom will not interfere with normal world competition and the consumption of goods to satiate human wants.

If (1) and (2) are realized, as they will be, we can postulate and meditate on the role of metals in the post-war economy. It is my privilege to discuss the heavy metals. This discussion is limited to the common heavy metals—steel, copper, zinc, lead, etc., and does not consider the rare or precious metals. I shall give my views on the role of the heavy metals in the period immediately following the war, say for 5 to 10 years. Predictions beyond that time seem unnecessary, and because of technical advances that will be made long time guesses probably would be wrong anyway. Furthermore, if we limit our discussion to a period of 10 years after the end of the war, we can more soundly view the problem in the light of metal and mineral reserves. There is no likelihood that our economy will change in that period because of the depletion of reserves within the United States or in places readily accessible to the United States. This, of course, is premised on the basis that the war will end in a reasonable period.

Many metal-conscious people feel that with the vastly increased production of aluminum, magnesium, plastics and glass the "old-line" metals such as copper, zinc, lead, and even

Firm post-war position for heavy metals is indicated by past experience, future consumer demands, and available supplies. Technical advances of war period to be reflected in our post-war economy.

By JOHN D. SULLIVAN

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steel are bound to suffer. The future can be viewed only in the light of the experience of the past plus the likelihood of new developments resulting from research and from geological and mining explorations. An analysis of the past can lead to only one conclusion, viz., our over-all consumption of metals is so great and the demand will increase so markedly after the war that to satisfy human wants the demand for virtually all of the basic heavy metals will increase. This is the thesis which I propose to develop in this discussion.

When production levels off in 1944 we shall have in the United States the capacity to produce about 110,000,000 tons of basic metallic and nonmetallic engineering products, and of this

amount steel will be about 85 percent of the total. Aluminum and magnesium combined will account for 1.3 percent; copper 1.3 percent; lead and zinc 1.8 percent; plywood and synthetic rubber, slightly under 1 percent each; glass, about 6 to 8 percent; and plastics about 0.2 percent. The size of the capacity of the glass industry may be a surprise to some of the listeners, because it is about the same, on a tonnage basis, as aluminum, magnesium, copper, lead, zinc, plywood, synthetic rubber and plastics combined.

* Estimates depend on how calculated. The glass industry does not maintain a rated production capacity as is maintained in the metal industries.

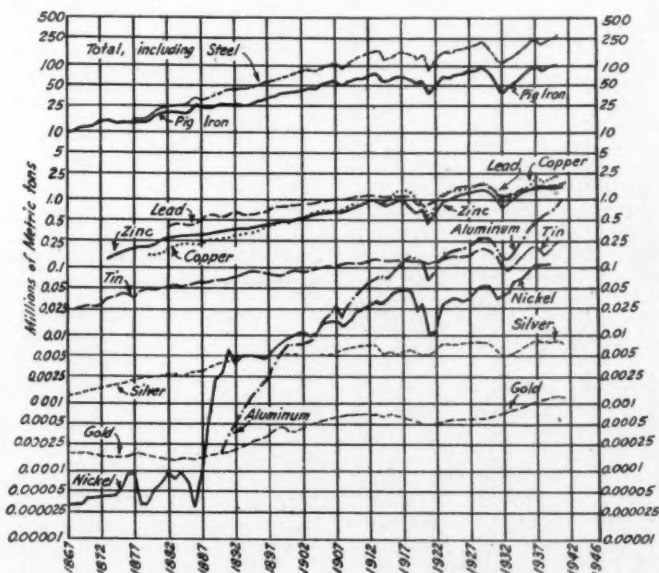


Fig. 1. World production of metals

Address presented to the Joint Meeting of American Mining Congress and Colorado Mining Association, Denver, Colo., January 27, 1944.

In the period since 1900 the industrial expansion has been so great that the world has used more of its mineral resources than in all preceding history.

Figure 1 shows the world production of major metals from 1867 to date. Note that this is a semi-logarithmic curve with year plotted against the logarithm of production. As a specific example the world's copper production was about 150,000 metric tons in 1880 but it was nearly 2,300,000 metric tons in 1937, and the estimated production in 1942 was about 2,600,000 metric tons.

Iron and Steel

By the end of the expansion program in 1944 we shall have in the United States a total of 255 blast furnaces with an annual production capacity of 70,441,000 tons of pig iron; 981 open hearth steel furnaces with a capacity of 83,500,000 tons; 35 Bessemer with a capacity of 6,000,000 tons of Bessemer steel; and 236 electric furnaces with a capacity of 6,250,000 tons. This gives a total steel capacity of about 96,000,000 tons.

In connection with our increased steel production program the expansion of the steel industry in the West is worthy of note. Table I shows that there are now in the West 59 open hearth furnaces with an annual production capacity of 4,300,000 tons. There is also a production capacity of 320,000 tons of electric furnace steel from 14 furnaces. The Western expansion has been largely in the new plant at Geneva, Utah, where 3 blast furnaces with a capacity of 1,150,000 tons of pig iron and 9 open-hearth furnaces with a capacity of 1,300,000 tons of steel have been built and in the Kaiser plant at Fontana which has one blast furnace rated at 430,000 tons and 6 open-hearths rated at 675,000 tons.

We might view the Western steel expansion in the light of the civilian shift of population. Figure 2 is the estimated percentage change in civilian population from April 1, 1940, to March 1, 1943, from the Bureau of the Census. The dark areas, indicating increases, show a westward movement of population, particularly to the West Coast, which speaks well for a potential increased demand of consumers metal goods in this region after the war.

A breakdown of the uses of steel by industries gives a further insight into the probable post-war demands. Table II gives a comparison for two typical years, 1937 as a prewar and 1943 as a war year. In 1937 automobile and construction industries consumed about 36 percent of the total steel, whereas in 1943 these industries consumed only about 16 percent of the total. In contrast, shipbuilding used

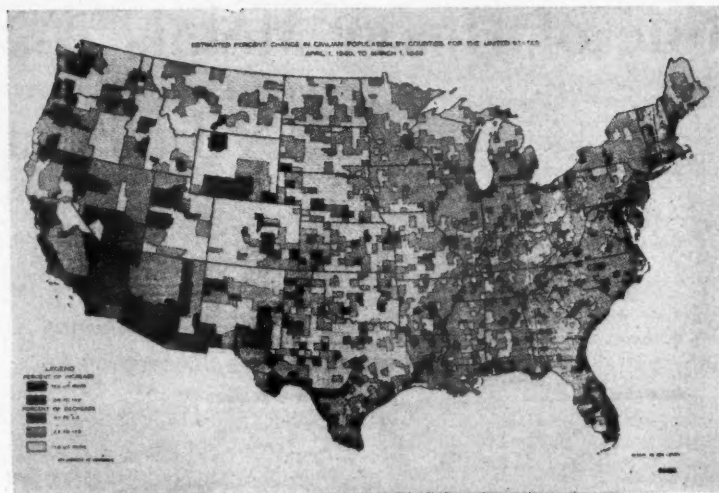


Fig. 2. Changes in distribution of civilian population

only 1 percent of the total steel in 1937, whereas our naval and maritime program resulted in stepping up consumption in this industry to 21 percent of the total in 1943. Because of lend-lease, exports have increased. Even railroads, despite the increased transportation demands imposed by war, consumed only 8 percent of the total in 1943 as contrasted with 11 percent in 1937. These data show that normal civilian channels are not being supplied, and we can expect that these demands will be filled when steel products again become available.

After the war, it may be expected

that there will be a trend towards increased use of alloy steels, both of the S.A.E., the low-alloy type, and the National Emergency steels developed during the war. To conserve on the weight of steel necessary for a given purpose the low-alloy, high-yield strength alloy steels were developed a few years ago. These contain from 2 to 4 percent of alloying elements and will allow an increase in load of 50 to 100 percent over the usual mild steel. They are made on a large tonnage basis and do not require heat treatment or other special handling. They may be welded readily. Their

IRON AND STEEL

TABLE I—PRODUCING CAPACITY IN THE UNITED STATES
AT THE END OF THE EXPANSION PROGRAM SCHEDULED
FOR COMPLETION IN 1944

	Net Tons			
	No.	Western Capacity	No.	Total U. S. Capacity
Blast Furnaces	10	2,874,850	255	70,441,100
Steel Furnaces:				
Open Hearth	59	4,321,320	981	83,351,260
Bessemer	none		35	6,074,000
Electric	14	320,700	236	6,248,470
Total Steel Capacity		4,642,020		95,948,030

TABLE II—STEEL DISTRIBUTION BY ALL INDUSTRIES

Industry—	Percent of total	
	1937	1943
Agriculture	5.7	2.3
Aircraft	Negligible	5.4
Automotive	18.9	10.3
Construction	14.7	6.7
Containers	7.8	5.1
Machinery tools	4.4	3.0
Oil, gas, water mining	7.4	4.4
Pressing, forming, stamping	3.6	8.1
Railroads	11.4	20.7
Shipbuilding	0.9	13.8
Exports	9.5	20.2
All others	15.7	
Total	100.0	100.0

rapidly expanding use, largely in the transportation industry, was stopped by the war because they required alloys needed for the more highly alloyed and for the heat-treatable steels so necessary to munitions. As a result the new National Emergency steels were developed. These depend on the use of a minimum content of alloys, usually less than 2 percent, which confer extreme hardenability on steel that has been heated and quenched. There is evidence that the favorable experience during the war will lead to a substantial increase in steels of the NE type after the war. This is particularly true since the character of the scrap will be such that it may be easier to make such steels than to avoid high residual alloy content in plain carbon steels. In 1943 we produced about 15,000,000 tons of alloyed steel made either in electric or open-hearth furnaces. This is nearly one-third of the production of plain carbon steel. Of the 15,000,000 tons, about 4,250,000 tons was of the NE type. We may feel quite certain that the low-alloy, high-strength steels will be used in increasing amounts after the war, particularly in the transportation industry. The S.A.E. alloy steels will find many engineering applications.

I believe that we may expect an increased "clad era" after the war. For example, we can expect aluminum-clad and copper-clad steels to combine the strength of the steel and corrosion resistance or other properties of the cladding material. We may also expect metal-clad plywood, employing steel, copper, and aluminum as the cladding metal.

We shall have ample iron ore, scrap and coke to meet our immediate post-war needs. The rapid depletion of our high grade iron ore reserves during the war will hasten the day when more and more lower grade ores requiring beneficiation will be used. Fortunately, the iron ore producers are facing the problem in a realistic manner and are already preparing by means of a well conceived research program to be prepared to use lower grade ores when the necessity arises.

Sponge iron processes are not likely to be active after the war. They can not hope to compete with the highly efficient blast furnace process of making iron from ore.

Steel Alloying Constituents

Manganese

The most commonly used alloy for steel is manganese. On the average, every ton of open-hearth steel made in the United States consumes about 12 pounds of metallic manganese. Before the war the supply came almost exclusively from foreign sources. We now have a domestic production in Cuba and Montana equivalent to one-third to one-half of our normal peacetime

consumption. These operations will likely continue after the war. Other domestic operations are likely to cease. A chemical beneficiation process is in operation in Nevada.

Electrolytic manganese was produced in a small way before the war and at the present time there is a production in the United States on the order of two to three tons per day. After the war the consumption of electrolytic manganese will depend on the development of its use in non-ferrous alloys. Until the price is considerably cheaper than it is at present, no large-scale operations, even in this field, are in sight.

Chromium

Chromium is used in stainless steels, the low-alloy steels, and during the war in large amounts in armor plate. As in the case of manganese we are dependent largely for our supply from foreign sources although domestic sources were opened during the present war. Most of these operations have been recessed because of the healthy stockpile situation.

Chromium is also used in electroplating. We can expect an increasing amount of use in this application after the war. The tonnage of chromium used in plating, however, is small in comparison to alloying use.

Nickel

Nickel finds its widest use in alloy steels, particularly of the stainless type. Its nonferrous uses except in such alloys as monel metal and admiralty brass are not great. It also finds extensive use in electroplating. In 1940 approximately 6,500 tons of nickel was used in electroplating. In 1942 we used a total of about 135,000 tons of nickel for all purposes. Although the United States is dependent on foreign sources, principally Canada, for its nickel, the increased use of stainless steel, for example in the chemical industries, and of electroplated parts will continue the demand for this metal. The use of corrosion- and heat-resistant steels today is a "must," and so long as this continues we shall have a large demand for the metal.

The High-Speed Tool Steel Alloys: W, Mo, V

Tungsten, molybdenum and vanadium find other uses than in high-speed tool steels. The versatility of molybdenum has led, particularly during the war, to its substitution for other metals. The United States is better situated than any other country in the world as regards molybdenum ore reserves. In addition to molybdenum ores in the Western states, particularly Climax in Colorado, appreciable amounts are now being recovered as a by-product from sulphide copper concentrators in various Western states. In 1942, output of molybdenum in concentrates and

ore in the United States was 57,000,000 pounds and of this 73 percent came from Climax; 3 percent came from other molybdenum ore producers; 24 percent was by-product from copper concentrators.

Tungsten before the war was imported in large amounts from China but during the war our domestic production, supplemented by stockpiles on hand and with restrictions in use, served to supply the war needs.

Vanadium is mined in several Western operations, and there are enormous tonnages of titaniferous magnetite in New York from which the vanadium can be recovered by an iron blast furnace smelting technique or by a chemical process should the necessity arise.

It can be expected that molybdenum, tungsten and vanadium will continue to be used in large amounts after the war. So many uses have been found for molybdenum and because ample supplies are available it can be expected to be in increasing demand for a multitude of alloy steels. The conversion from war to peacetime industry will involve a big tool and die demand. Here the high-speed tool steels will find large application immediately after the war.

Copper

More has been said during the past couple of years about what aluminum and magnesium are going to do to copper after the war than to a much more serious problem, i.e., in the next quarter of a century where are we going to get enough copper to meet the demands?

Taking 1937 as a typical peacetime year it is interesting to study the breakdown of the uses of copper.

Industry—	Percent of total
Electrical manufactures	25
Telephone and telegraph	5
Light and power lines	10
Other wire	12
Automobiles	13
Buildings	8
Refrigerators	2
Other uses	21
Manufactured for export	5

There is no doubt that aluminum has already cut into the uses of copper in the electrical industry, particularly in transmission lines. It is fortunate that there is such a substitute for copper for this purpose because it thus leaves additional copper available for other essential uses. Because of its current carrying-bulk factor copper is almost essential for use in motors, generators, and other moving parts and where volume is an important item. After the war we may expect an increase on a grand scale of rural electrification. Aluminum is likely to get the transmission lines, but the domestic wiring and the electrical appliances will use copper. Immediately after the war there should be an enormous electrical demand on copper.

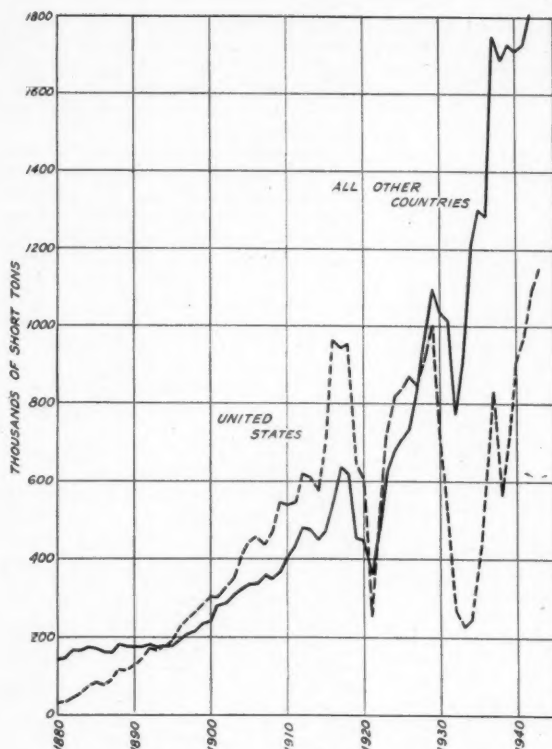


Fig. 3. Copper production, United States and all other countries, 1880-1943

Copper enjoys a most enviable reputation in the architectural and building fields. In them copper is synonymous with quality, and it would appear that with increased standards in building we can expect the use of more and more copper.

Copper is easily workable, and this property gives it a large market which it will hold for some time. The tonnage going into such channels as novelty goods and ash trays is not inconsequential.

Despite the inroads of stainless steels, brasses and bronzes are still in great demand and there is no obvious reason why the demand will not continue, although there is no apparent reason to expect a sharp increase. Brass will continue to be used as will copper in the plumbing industry. Copper-bearing steels will be produced in larger amounts than before the war.

After the war there will be large amounts of secondary copper and its alloys available and this supply may reflect for a time on primary metal production. In the long run, however, the future looks bright for the copper mines. The inherent properties of copper will keep it in demand but because the world's supply is relatively small compared to the demand we can expect that in the course of the next quarter of a century copper may be classed as one of the "semi-precious" metals in the class of tin

and nickel. As the amount of cheaply produced copper will decrease because of depletion of reserves, the supply will come from lower grade higher cost ores. The resultant higher cost copper will be used in those applications where its specific properties justify its use despite a higher cost. Copper will, even at much higher costs, find ready use in a multitude of applications.

Zinc

From 1922 to 1941 (Table III) the consumption of zinc has varied from a low of 260,000 tons in 1932 to a high of 830,000 tons in 1941. Also, except for die castings, which came into prominence about 1925, the breakdown of uses did not change a great deal. In 1937

the percentage uses were as follows: Galvanizing, 41.6; brass, 27.8; sheet zinc, 9.6; die casting, 14.6; others, 6.4.

Resistance to corrosion is an outstanding characteristic of zinc. During the war some effort was made to replace galvanized steel with lead-coated steel. While marked advances have been made in electroplated and hot-dipped lead coatings, these products are not likely to replace galvanized products in a large measure

in the near future, although with continued improvements lead-coated products can be expected to be used in increasing amounts. It is probable that in the case of telephone line pole hardware lead-coated products will retain the market already taken from zinc. Because civilian consumption has been cut, there should be a large immediate post-war demand for galvanized products, particularly for replacement purposes.

As stated under copper, there is still a demand for brass and bronze despite the inroads of competitive products. It is not to be expected, however, that there will be any marked increase in the use of these products.

The zinc die casting field should remain active. Wheels, housings, pumps, etc., can be readily cast, and much machining is saved over using iron or steel. The zinc die castings are resistant to corrosion, and this factor combined with the simplicity of production should increase their use. Zinc salts will find continued use in paints. There will be large amounts of secondary brass, particularly cartridge cases, available after the war. This will relieve somewhat the pressure on the zinc mines, which have been operating even at a strained capacity during the war.

Lead

Despite the enormous demand for lead it has been one metal that has been available in adequate amounts during the entire war. Table IV shows the consumption by industries from 1923 to 1941 from all sources, i.e., primary, secondary, and antimonial lead. The automotive industry is an enormous consumer of lead. Again considering 1937, of the total of 679,000 tons consumed, 28.3 percent went into storage batteries, 1.8 to "automobiles," 2.2 to bearing metal, and 8.8

TABLE III—ESTIMATED MANUFACTURE OF ZINC IN THE UNITED STATES

THOUSANDS OF SHORT TONS						
Year	Galvanizing	Brass Making	Sheet Zinc	Die Casting	All Other	Total
1922	205	145	54	...	36	440
1923	235	175	50	...	49	515
1924	240	155	61	...	56	512
1925	283	165	71	...	60	579
1926	290	180	86	14	52	622
1927	280	160	74	18	51	583
1928	291	174	74	30	58	627
1929	290	185	68	36	55	634
1930	217	120	51	22	41	461
1931	168	98	49	20	35	370
1932	109	66	40	17	27	259
1933	148	94	41	26	41	350
1934	152	98	41	32	37	360
1935	195	124	57	55	42	473
1936	242	165	55	72	48	582
1937	252	169	58	88	39	606
1938	198	102	46	48	27	421
1939	275	175	62	84	30	626
1940	287	232	58	116	26	719
1941	300	313	69	125	24	831

From American Bureau of Metal Statistics.

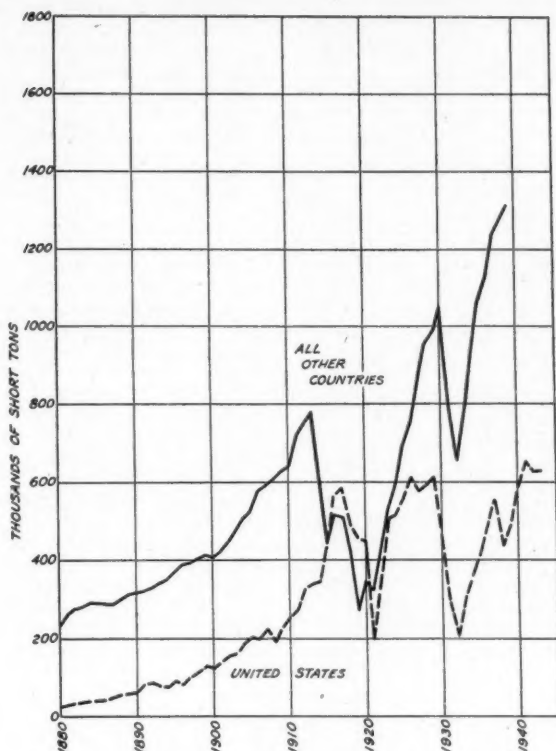


Fig. 4. Zinc production, United States and all other countries, 1880-1943

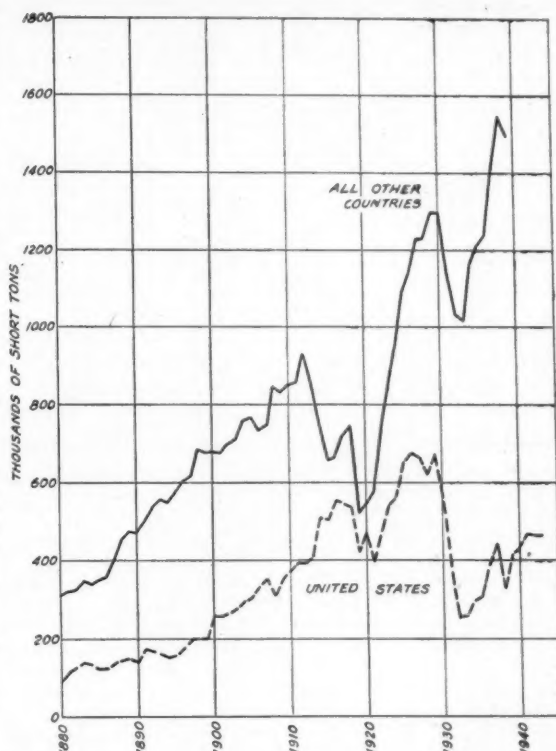


Fig. 5. Lead production, United States and all other countries, 1880-1943

to "others." "Others" in this category is largely tetraethyl lead. In addition red lead and litharge enter into the manufacture of battery plates and pigments used in the automotive industry. As soon as automobile production for public consumption is again permitted a large outlet for lead products is created.

The development of higher octane gasolines will result in the greater use of tetraethyl lead because this anti-knock compound becomes relatively more effective as the octane rating of the gasoline increases. With the development of supercharging and high output automotive motors, the use of high octane gasoline can be expected to expand.

Although the tonnage is not great, there will be a demand for the easily produced solder die castings for various uses such as gears, cups, home equipment parts, etc.

As mentioned under zinc, lead-coated steel products are being consumed in greater amounts, and have already captured some of the market. It is expected, however, that they will meet stiff competition from galvanized steel, when zinc again becomes available. Uses of lead in solder, cables, small arms ammunition, bearing metals, buildings, paints and ceramics are likely to continue in the usual manner.

Tin

Table V gives a summary of uses of tin by industries from 1917 to 1940. The two major items were hot dipped tin plate and solders, which combined accounted for approximately two-thirds of the entire consumption. In normal times 50 to 60 percent of the tin plate went into the food pack canning industry, which includes general goods but not canned milk, which itself used nearly 15 percent of the total tin plate. The rest went into

general packaging and into miscellaneous uses, one of which is so-called prefabricated plate, used largely in the novelty field. This may involve a chromium-plated tin plate sheet, which goes to the stamper for fabrication into articles.

During the war substitution and conservation has changed markedly the tin plate industry. Black untinned containers are being used for non-foods and for a limited amount of food packaging. Canning in glass, refriger-

TABLE IV—ESTIMATED USE OF LEAD IN THE UNITED STATES
Thousands of Short Tons

Year	Storage Batteries	White Lead	Red Lead	Cable Covering	Buildings	Ammunition	Foil	Automobiles	Solder	Type Metal	Calking	Bearing Metal	Castings	Others	Total
1923.....	143	180	46	131	75	40	33	11	30	12	25	28	15	49	768
1924.....	170	160	34	138	83	27	35	11	30	13	26	32	15	48	812
1925.....	180	131	42	156	88	32	33	13	35	15	30	34	18	50	857
1926.....	190	120	36	185	94	32	35	17	37	16	32	36	18	53	901
1927.....	175	126	38	161	88	34	30	12	35	16	30	31	17	48	841
1928.....	220	123	31	180	96	39	35	17	37	17	32	32	18	54	931
1929.....	210	120	30	220	96	41	40	18	37	18	31	33	18	60	972
1930.....	163	84	32	208	67	33	26	11	27	16	21	20	12	48	768
1931.....	157	78	18	117	40	30	20	6	21	14	15	12	7	33	568
1932.....	135	54	32	56	22	23	14	4	14	11	10	10	5	24	417
1933.....	147	59	38	31	26	32	23	5	16	11	12	11	5	33	449
1934.....	163	65	42	35	30	35	16	7	16	13	10	12	5	39	482
1935.....	175	80	48	39	32	29	16	10	20	15	12	13	5	45	539
1936.....	191	86	54	61	40	32	20	11	22	17	14	17	6	55	634
1937.....	192	86	57	90	45	40	22	12	22	17	15	15	6	60	679
1938.....	167	71	43	60	36	31	22	6	15	12	12	9	6	56	546
1939.....	198	75	57	75	50	42	22	9	20	14	16	13	7	69	667
1940.....	220	66	69	107	65	56	24	11	24	17	19	14	9	91	752
1941.....	245	85	89	173	95	72	45	12	36	20	31	25	14	108	1,050

From American Bureau of Metal Statistics.

TABLE V—USES OF PRIMARY TIN AND SECONDARY TIN IN THE UNITED STATES

Long Tons, Tin Content of Finished Products										
Year	Tin Plate	Terne Plate	Solder	Babbitt	Bronze	Collapsible Tubes	Tinning	Coil	Chemicals	Miscellaneous
1917...	27,600	*	17,000	10,800	4,800	2,100	1,900	4,000	1,718	6,339
1925...	28,000	*	20,000	10,000	5,000	7,500	†	‡	2,500	7,000
1927...	24,525	*	13,602	7,595	4,664	2,710	2,661	4,193	2,621	5,627
1928...	27,053	*	13,874	8,150	4,324	2,864	2,636	5,068	4,246	6,154
1930...	27,753	*	11,407	5,438	3,499	3,826	2,314	3,061	3,268	4,382
1935...	27,290	1,064	16,644	5,152	4,330	3,548	2,082	1,629	3,272	5,662
1936...	33,750	1,312	18,750	6,679	6,190	3,556	2,390	1,688	1,555	7,130
1937...	39,221	1,397	19,858	6,773	6,496	3,571	2,652	1,460	1,502	7,200
1938...	23,546	1,007	12,798	4,157	3,932	3,427	1,773	2,283	1,076	5,776
1939...	36,640	1,454	17,279	5,448	6,436	3,507	2,337	2,001	455	6,871
1940...	38,674	1,513	19,019	7,646	14,660	3,512	2,720	1,713	382	7,315
Total										
										76,257
										80,000
										63,198
										74,369
										65,448
										71,173
										83,050
										90,130
										59,774
										82,428
										97,154

* Included in tin plate.

† Included in miscellaneous.

‡ Included in collapsible tubes. From Metal Statistics, 1942.

eration and dehydration are helping to keep down the requirements. The new electrolytic tin processes are gradually replacing the old hot dip methods, and the coating is of the general order of about one-half the thickness of the previously used hot dip plate.

Following the war when tin becomes available we shall probably revert to the use of heavier tin plate. This may be applied electrolytically rather than by the old hot method but it is likely that the weight of coating will exceed, at least in the immediate future, 1 pound per base box, and may run 1½ pounds.

In prewar days tin solder, an alloy with 30 to 50 percent of tin, was the second largest user of the metal. During the war for many purposes tinless solders have been used. The most prevalent type is 97½ percent of Pb—2½ percent of Ag. It is believed, however, that after the war industry will revert to the old high-tin type of solders. They are no more costly and while the tinless and low-tin solders have been handled successfully in most cases, they are not so easy to use or so flexible as the high-tin solders, particularly in hand soldering shops.

Tin will be used in babbitts, bronzes, etc., as before the war, even though in the emergency low-tin or tin-free products have served well in the absence of the standard products formerly employed. It is expected that tin again will be used in the collapsible metal tubes for tooth paste, shaving cream, etc., although there will be serious competition from aluminum.

The United States now has a tin smelter in Texas, which will be operated after the war if foreign concentrates of suitable grade can be secured at a competitive price.

Discussion

As stated at the start, the role of the heavy metals after the war can best be judged by the past, the probable future consumer demands, and ore reserves both domestic and readily

available to the United States. The key to the probable future lies in Figure 1. Metal demands have increased enormously and in the economy which this country can expect after the war there is no reason to expect a lessening of human wants in the immediate post-war period. Americans are metal consumers. In addition, we are a manufacturing nation, and depend in a

large measure for the maintenance of our standard of living on importing raw materials from foreign countries and smelting, refining and fabricating products which are returned in part to the countries from which the raw materials originated. This is the basis of American industry. We shall continue to import those raw materials of which we have an inadequate supply, and to repay the producer nations either in fabricated products of kind or in fabricated products resulting from our own domestic resources. We have, therefore, not only an enormous post-war domestic need to fill but also a huge potential foreign market. During the war for military purposes we have been giving more and more materials to "friendly" nations. This practice will serve to create human wants in those countries which, after the war, we should be in a position to help satisfy. China has to date been an almost untouched field for American commerce. After the war there is lit-

tle doubt but that this sphere can be greatly enhanced.

With our expanded industry due to wartime construction, with highly efficiently operated plants, and with manufacturing and marketing know-how, we should be in an excellent position after the war. Domestic civilian consumption of heavy metals has been cut to a low figure, and replacements of automobiles, refrigerators, radios, household utensils and appliances, stoves, etc., will consume metals in large amounts. Moreover, we have had good wages, and laborers have wisely invested in War Bonds with the idea of cashing them in for consumer goods when the latter again become available.

The necessities of war furnish one of the best stimuli to technical advancement. The essentiality of conservation and substitution has brought forth through research marked technical advances. These will be reflected in the post-war economy. Steels and other alloys of high strength will prove to be a boon in the transportation industry where the saving of a ton of weight in rolling stock permits carrying a greater pay load. More and more shall we go to tailor-made me-

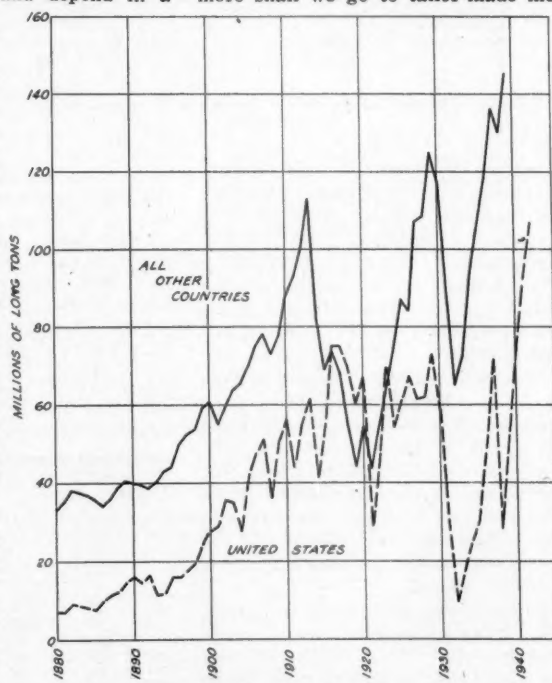


Fig. 6. Iron ore production, United States and all other countries, 1880-1943

talic products for specific applications to gain the advantages of inherent properties of various heavy metals and their alloys. I believe that we can re-phrase the old proverb, "The poor and taxes always will be with us," to, "After the war an increased demand for the heavy metal products,—steel, copper, lead, zinc, tin, etc., will be with us."



A wide variety of modern machines calls for constant safety supervision

SAFETY at the Utah Copper Mine

A well organized system of inspections and reports aids world's largest copper producer in keeping extensive workings and large numbers of machines operating safely. "Hazard Factor" employed as a means of accurately comparing departmental accident records.

IT HAS often been said that a building is only as good as its foundation. It may also be said that a producing organization is no better than its safety practices.

Before going into the details concerning the safety practices at the Utah Copper Company open-cut copper mine at Bingham Canyon, Utah, it will be useful to the reader to have, as a background, some concept of the vastness of the workings. The mine extends from the bottom of West Mountain to the top, a vertical distance of 1,700 ft., in a series of levels or benches. Forty-one electric power shovels operate on the levels and the 5,000 volts of electricity necessary to operate these shovels is conducted to them by means of lines carried on movable steel towers and insulated trail cables. The railroad system on "the hill," as the mine is colloquially called, is all standard gauge and consists of about 120 miles of track, including switch backs connecting the various levels, most of which is elec-

trified for the operation of 63 80-ton electric locomotives. At the present production rate, approximately 75,000,000 tons of copper ore and overburden are moved annually and 6,000,000 pounds of powder are used in blasting operations. There are 2,280 employees on the mine payroll who operate trains and shovels, handle drilling and blasting operations, or work in machine, boiler, blacksmith, electric, drill repair, car and carpenter shops.

The safety department is composed of a departmental head, with the title of safety engineer, four day shift safety inspectors, one night shift safety inspector, one junior inspector, and one clerk. The inspector's duty is to thoroughly cover each level on

"the hill," meaning literally to visit every shovel, track gang, powder gang, electric train and all electrical work crews. These "safety men" are constantly on the alert for any unsafe method of work or any unsafe equipment. They are instructed to listen carefully to any suggestions made by foremen or employees and to submit their reports and recommendations to the safety engineer.

A monthly report is compiled from these daily findings, a copy of which is given to each departmental head at a meeting of general foremen held on the second Monday of each month, at which the general superintendent of mines acts as chairman. Every item in the report is discussed, and each general foreman is given a list,

By G. W. KNUDSEN

Safety Engineer

prepared by the safety department, of safety repairs needed in his particular department.

A foreman's safety meeting is held the third Monday evening of each month, attended by general foremen, foremen and sub-foremen, at which the safety engineer acts as chairman. General safety matters are discussed, particularly the details of disabling accidents for the month and ways suggested to avoid repetition. Each foreman is given a mimeographed pamphlet prepared by the safety department containing a brief but pertinent article on safety and the statistical accident standing of each department.

New Employee Instructions

After the initial hiring procedure, a new employee is referred to the safety department. Here he is instructed in general safety as affecting not only himself but his fellow workers, is given a pamphlet of safety rules for his specific job, and informed of the opportunity of participating in all the various benefits the company offers to its employees.

Medical service and hospitalization, with minor exceptions, are available to employees. Medical treatment is provided at the Utah Copper Hospital in downtown Bingham Canyon, and at medical offices in Salt Lake City, and hospitalization at a Salt Lake City hospital. New employees are instructed to report immediately to company physicians for medical and surgical treatment for any illness or injury occurring on the job, regardless of how slight the injury.

If the employee, upon applying for medical aid, is found to have a disabling illness, he is given a "lay off" card, which later will be his release to return to work when "okayed" by a company physician. Every illness has a code number which is recorded on the employee's card. Since sick absenteeism is responsible for a great manpower loss in most every industry, records are diligently maintained. From these daily reports, health absentee records for the month and year are compiled. These absentee records state clearly the reason for time loss by employees, the exact number of days lost per man, and what malady is responsible.

Accident Records Stressed

When an accident occurs, the patient is transported immediately to the mine emergency hospital, where he receives emergency treatment. If the injury does not require hospitalization, the patient is treated by the company doctors at the doctor's office and the following records are obtained: In the case of an industrial injury, a "red" card is made out which

"White Card"

UTAH COPPER CO.

Form 4452

PHYSICIAN'S MEDICAL REPORT OF ACCIDENT NON-INDUSTRIAL ACCIDENT

Name..... P. R. No.....
Occupation..... Place accident occurred.....
Date injured....., 19.... Hour..... M. Weather.....
Date first attended....., 19.... Hour..... M. Doctor.....
How injured, 19.... Hour..... M. Doctor.....
.....
Description of injury and treatment.....
.....
Date told to lay off....., 19.... Hour..... M. Probable disability.....
Date of report.....
Signed.....
Company Physician

(Reverse side)

EMPLOYEE'S REPORT OF ACCIDENT

How did accident occur?.....
.....
Remarks, 19.... Hour..... M. Weather.....
.....
Witnesses, 19.... Hour..... M. Doctor.....
Investigated by..... Date....., 19.... Hour..... M. Probable disability.....
This accident occurred off the job. Signed.....
Injured Employee
"Red Card"

Form 3877

UTAH COPPER COMPANY

PHYSICIAN'S MEDICAL REPORT OF ACCIDENT

Name..... P. R. No.....
Occupation..... Place accident occurred.....
Date injured....., 19.... Hour..... M. Weather.....
Date first attended....., 19.... Hour..... M. Doctor.....
How injured, 19.... Hour..... M. Doctor.....
.....
Witnesses to injury.....
Description of injury and treatment.....
.....
Date told to lay off....., 19.... Hour..... M. Probable disability.....
Date of report.....
Signed.....
Company Physician

(Reverse side)

FOREMAN'S REPORT OF ACCIDENT

How did accident occur?.....
.....
Did injured report to you?..... When....., 19.... Hour..... M. Probable disability.....
Version of injured employee.....
.....
Remarks, 19.... Hour..... M. Doctor.....
.....
Witnesses, 19.... Hour..... M. Doctor.....
Investigated by..... Date....., 19.... Hour..... M. Probable disability.....
Signed.....
Foreman

ACCIDENT STANDING OF DEPARTMENTS—December 1, 1942

Department	Number of Disabling Accidents		Number of Accidents Causing Time lost of 1 Day or less		Number of No-Time Lost Accidents		Total to Dec. 31, 1942*	Number of Shifts Worked to Dec. 31, 1942	Number of Accidents per 10,000 Shifts	Hazard Factor	Final Accident Frequency Rate
	Dec.	Year to Dec. 31	Dec.	Year to Dec. 31	Dec.	Year to Dec. 31					
1. Water Service	0	0	0	0	0	6	.30	17161	.17	1	.17
2. Carpenters	0	0	0	0	1	28	1.40	25032	.56	1.5	.37
3. T. & S. crews	1	12	0	1	9	178	21.10	157036	1.34	2	.67
4. Electricians	0	4	0	0	4	59	6.95	46849	1.48	2	.74
5. Shopmen	0	2	0	0	7	105	7.25	59827	1.21	1.5	.81
6. Trackmen	1	14	0	0	28	443	36.15	244728	1.48	1.5	.98
7. Car Repairers	0	2	0	0	7	55	4.75	23721	2.00	1.5	1.33
8. Powdermen	1	19	0	0	11	122	25.10	61890	4.06	2.5	1.62
Miscellaneous	0	2	0	0	4	35	3.75	66542	.56		
Total.....	3	55	0	1	71	1031	106.75	702786	1.52		

* 5 accidents causing time lost of 1 day or less equals 1 full-time accident.

20 accidents causing no time lost equals 1 full-time accident.

Each department is rated according to the hazard of the work in that department. This rating is called the Hazard Factor. The number of accidents per 10,000 shifts in any department divided by the Hazard Factor for that department reduces all types of work to a common basis so that the progress in accident prevention can be accurately compared. WHERE DO YOU STAND?

shows the employee's name, payroll number, occupation, time and location of accident, weather, time of reporting to doctor, nature and cause of injury, and probable disability. Most industrial injuries do not result in disability. These cards are then transferred to the safety office where each inspector takes the cards assigned to his particular mine area. The inspector investigates the reasons for the accident, obtains the report of witnesses, and has the foreman sign the report of the accident prepared by the inspector.

These accidents are segregated according to departments and are tabulated according to severity and frequency ratings. These ratings are determined as follows:

Five accidents causing time lost of one day or less equal one full time accident.

Twenty accidents causing no lost time equal one full time accident.

The "Hazard Factor"

Each department is rated according to the hazard of the work in that department. This rating is called the "Hazard Factor."

The number of accidents per 10,000 shifts in any department divided by the hazard factor for that department reduces all types of work to a like basis so that progress in accident prevention can be accurately compared.

Non-industrial accidents are recorded in much the same manner, and a "white" record card is used. The injured man states how his accident occurred and signs a statement prepared from his description.

Bulletin boards play an important role in safety education. On them are displayed safety posters, precautionary slogans, news reel "stills," statistical departmental standings, and picture posters warning against hazardous working methods.

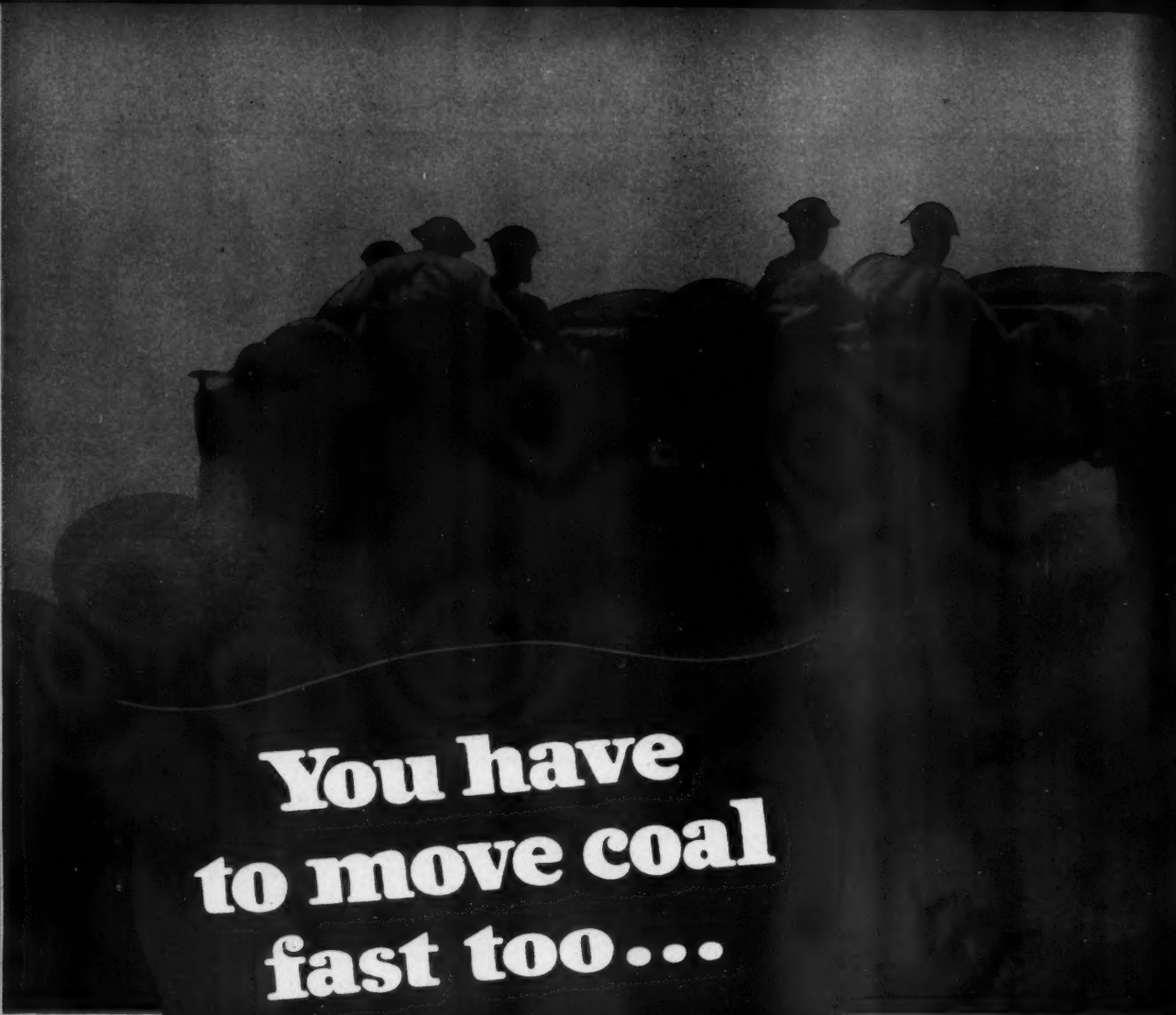
Signs warning employees to listen for blasting signals are conspicuously posted all over "the hill." Warnings are posted on all high voltage electrical equipment, caution signs are displayed on every locomotive and shovel and signs, properly located, request employees to use safety trails. Rules

are rigidly enforced regarding the proper upkeep of tools and care of supplies.

Salt tablets are distributed to employees in hot weather. Goggles and shields are available and their use required by every electric welder; also, employees in the drilling and blasting

Sound safety practice is required in every operation





**You have
to move coal
fast too...**

Armstrong Roberts

JOY mechanized



Joy Loaders have proved their worth in hard, constant service with the most severe usage. Strong, ruggedly built, their maintenance is at a minimum.

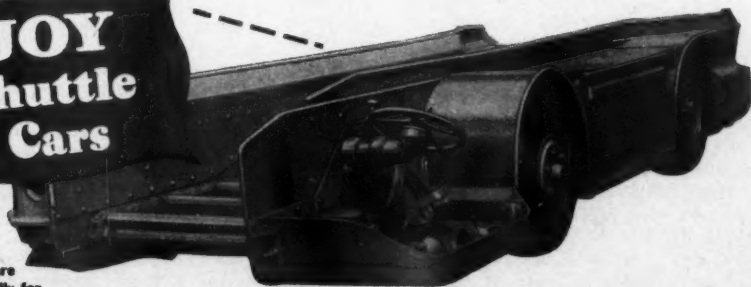


units

The difference between winning or losing the battle of production can generally be found in the efficiency, or lack of efficiency, of production equipment. Joy Mechanized Loaders and Shuttle Cars are doing an outstanding job in mines the Nation over—constantly creating new tonnage records by their naturally fast, thoroughly consistent operation.

**JOY
Shuttle
Cars**

Joy Shuttle Cars are designed specifically for mine service with a built-in ability to stand up under constant hard use.



JOY MANUFACTURING CO., Franklin, Pa.

GENERAL ACCIDENT STATISTICS—1933-1942

Year	NUMBER OF ACCIDENTS					DAYS LOST				FREQUENCY RATES				Severity Rates			
	Fatals	Permanent Partial	Temporary Total	Total Time-Lost	Total No-Time-Lost	1. Fatals	2. Permanent Partial	Total Temporary	Total Days Lost	Total Shifts Worked	Total Man-Hours Worked	Total Tons Ore and Waste Moved	Average Number of Men Employed	Per 10,000 Shifts	Per Million Tons	Per Million Man-Hours	Per 1,000 Men per Month
1933..	0	1	8	9	193	0	84	263	347	140,205	1,121,640	6,896,258	384	0.64	1.3	8.0	1.9
1934..	0	1	5	6	215	0	21	309	330	163,604	1,308,832	9,065,401	448	0.37	0.7	4.6	1.0
1935..	1	3	5	9	374	6,000	1,840	66	7,406	222,416	1,778,328	14,017,888	609	0.40	0.6	5.1	1.7
1936..	2	2	46	50	723	12,000	91	1,401	13,492	404,928	3,239,504	28,642,906	1,106	1.23	1.7	15.4	3.8
1937..	0	5	75	80	1126	0	1,253	2,601	3,854	637,383	5,099,064	51,426,742	1,746	1.26	1.6	15.7	3.8
1938..	1	5	35	41	682	6,000	2,072	1,850	9,922	412,123	3,296,984	30,302,584	1,129	0.99	1.4	12.4	3.0
1939..	2	4	43	49	971	12,000	2,334	1,621	15,955	509,557	4,076,466	42,436,063	1,396	0.96	1.2	12.0	2.9
1940..	6	4	56	65	950	36,000	489	1,401	37,890	596,867	4,774,936	56,838,778	1,635	1.09	1.1	13.6	3.3
1941..	4	2	58	64	1126	24,000	262	1,142	25,404	666,119	5,328,952	68,446,968	1,825	0.96	0.9	12.0	2.9
1942..	3	5	47	44	1031	18,000	1,886	1,239	20,625	702,786	5,622,288	72,814,334	1,925	0.78	0.8	9.8	2.4

1—The 6,000 days lost per fatal is based on the premise that the average man killed in an industrial accident had an expectancy of 20 years or 6,000 days of working life.

2—The days lost under the heading of Permanent Partial Disability is the time awarded in addition to the actual time lost.

The compensation paid includes awards for deaths, permanent partial disability and all compensation paid for temporary total disability.

department are required to use "hard-boiled" hats, which are furnished by the company.

Recreation and Housing

Many recreational opportunities are afforded employees. The R. C. Gemmell Memorial Club, located in the immediate vicinity of the mine, is a commodious and fully equipped modern club building. Comfortable reading and lounging quarters and meeting rooms are available. Bowling, billiards, table tennis and facilities for other indoor sports are provided. The auditorium, which seats about 1,500 for a fight or wrestling card, is also used for dances and basketball games, and the well equipped standard stage is used for theatrical or vaudeville entertainments.

An average of six special club features, such as picture shows, dances, or ball games (baseball in summer and basketball in the winter) are provided to Gemmell Club members and their families each month. Until the past year, an annual Utah Copper Field Day has been held for employees and their families at a nearby resort, at which good natured but spirited competition between departments existed in the many sport events, prizes were awarded winners, and free rides on concessions and ice cream provided for children of employees.

About 4 miles down the canyon from the town of Bingham, the company has erected the model town of Copperton. It has excellent schools and play grounds, and a large number of Utah Copper families dwell there. The houses are of brick or stucco construction, are modern, attractive and comfortable. All houses have copper roofs, gutters, down spouts and



Timely messages on bulletin boards bolster the safety program

screens and either brass piping or tubing. The company has spared no effort to make the townsite a community of contented families.

Strong First Aid Program

Every man on "the hill" is trained in first aid. Periodically, accredited Bureau of Mine courses are given for all employees. In case of an emergency, any employee is capable of administering first aid treatment for shock, applying tourniquets, dressing wounds or burns, applying splints, and administering artificial respiration. The company maintains an ambulance, available at all times for transportation of patients.

Success in combating accidents depends not only on the type of precau-

tionary and educational measures nor alone on the safety rules, but depends as well upon their practical application in the work day. For many years the company's executive as well as its mine management has recognized the value of proper safety work, and has supported an adequately manned and trained safety department. There must also be cooperation and enforcement by general foremen and their subordinate supervisors, as well as understanding compliance by employees themselves, competent and immediately available medical care, effective safety education, first aid training, careful investigation of accidents to remove causes, and complete records. These, complemented by a varied recreational program, are essential to a successful safety performance.

MANPOWER

What is being done to meet manpower requirements in the mineral industry.

By BRIG. GEN. WM. C. ROSE

Chief, Executive Services
War Manpower Commission

YOU gentlemen of the American Mining Congress and the Colorado Mining Association, have been living with the manpower problem for the last two years and know only too well that we have one and that it will not solve itself. To clear our thinking in the matter however I believe we are justified in taking time to determine why there is a problem; how it affects the mining industry and what has been and is being done to meet the situation.

We are in a total war. We have in the armed forces 10,500,000 men and women, and in the next six months will have 11,300,000. We have 15,700,000 workers in direct war industry with future requirements by June 30, 1944 of 15,800,000. Supporting war activities utilize another 7,700,000 and will need 200,000 more by mid-year. Essential agriculture requires around 8,700,000, with a summer peak of 12,100,000. Civilian economy, self-employed, et cetera, account for another 17,800,000, which number will remain relatively constant. All these make an overall current labor force requirement of 60,400,000, with a June 30, 1944 peak of 64,700,000, or 4,700,000 more. Fortunately for those of us responsible for procuring this number, 3,400,000 of these are seasonal agricultural workers, made up largely of school children, housewives who are willing to accept part-time work and others not normally in the labor market, leaving actually some 1,000,000 to be gotten into the armed forces and essential activities from wherever we can get them.

The summary I have given does not

Presented at meeting of the American Mining Congress and the Colorado Mining Association in Denver, Colo., on January 28, 1944.



Skilled minerpower goes underground for needed raw materials

—Courtesy New Jersey Zinc Co.

include loss replacements for the armed forces, which currently run around 75,000 per month or 450,000 for a six months' period. In some degree this additional requirement is compensated for by veterans being discharged because of minor physical defects, unsuitability for military service, wounds in battle, et cetera. At present a considerable majority of these can and do immediately re-enter the labor market, but we cannot count upon this favorable condition to continue, as more and more of these men who return to civil life will do so because of wounds in battle which will require greater or longer periods of rehabilitation. Many can never be counted upon to again enter the labor market.

Next Fall and Next Year

So much for the first six months of 1944. What of the situation beyond? We hope there will be a leveling off in the requirements of the armed forces, but so long as we fight both Germany and Japan, the number of

loss replacements I have just mentioned will not diminish. Rather, as the scope and intensity of battle increases—and they must to secure the victory for which we are fighting—the number will increase to an extent that cannot be foretold. So far as can be seen at this time, the number of boys who reach the age of 18 will not cover this replacement item and it will be necessary to dip further into the reservoir of fathers and non-fathers now deferred because of industrial necessity to meet our all-over requirements.

There is no doubt a question in your mind as to whether or not there may be some decrease in industrial requirements. Probably a few thousands, perhaps a few hundred thousand, depending on war requirements, but considered in the light of the all-over picture, it will be but a drop in the bucket, certainly not enough to afford any appreciable relief to those less essential activities that are now clamoring for assistance.

One may well ask, "Why must these tremendous industrial requirements

continue, since the Army will have been adequately equipped; the Navy will have expanded to the extent deemed necessary for victory; and the Maritime Commission will have furnished us with adequate bottoms to meet our requirements?" As to Army requirements, you must remember that equipment wears out or is destroyed in battle; that the harder and more intense the fighting, the greater the expenditure for munitions of war. Just as an indication of what happens to our military equipment, let me cite some figures from the Sicilian campaign which, as you know, was really but a side show:

13 per cent of all 155 mm. howitzers landed by the Allies.

46 per cent of all 57 mm. guns put into action.

13 per cent of 37 mm. guns employed.

8 per cent of all medium tanks and 7 per cent of all light tanks.

54 per cent of the carriages for the 37 mm. guns.

36 per cent of the motor carriages for the 77 mm. guns.

22 per cent of the carriages for the 105 mm. howitzers.

The percentage of each of these items will be greater rather than less in any operations on the European continent, and are probably being exceeded in Italy right now. Certainly they are being exceeded in our operations against the Japanese because not only have we the Japanese to deal with, but climatic conditions there are not favorable to low maintenance. Too, the Navy must be supplied with munitions, and battle damages plus normal wear and tear will exact their toll. No appreciable reduction there. The Maritime Commission has indicated a possible reduction in their requirements in 1945, but point out that unexpected submarine losses or increased and anticipated demands may preclude this desirable result.

Why a Manpower Problem

Let me summarize the "why" of the manpower problem. The war is not yet won, and though we have had soul-satisfying successes, frequently blown up beyond their real value by enthusiastic newspaper and radio strategists, aided by a goodly mixture of wishful thinking on the part of the American public, our national manpower requirements still demand all the manpower in sight. Until the war load decreases we can expect little if any diversion of workers to so-called post-war purposes. I can however say that just as rapidly as war requirements will permit, all governmental agencies involved will promptly and enthusiastically cooperate with management and labor in such diversion and in numbers commensurate with safety to our continued war effort.

Let us now examine what has been done and the task that lies before us.

On the War Manpower Commission side, somewhat over a year ago, we started a six-point program which met the requirements of the situation as it then existed. More recently this program was reexamined in the light of the current situation and became a seven-point one. Incidentally, to those of you who are familiar with the six-point program and who like mental gymnastics, I suggest a comparison of the current seven-point program with the old. You would find that every point in the latter is directly or indirectly included in the former, which frankly gives us what we think to be cause for justifiable gratification.

WMC Seven Point Program

The first of the seven points is that we must have the facts as to our manpower requirements. We are getting them and making them available to each of the several hundred labor market areas. I will not try you with the method or the statistics, but I can say for the result that figures for American labor market demand and supply are the most accurate of any major nation in the world.

Our second point comes from the fact that on the national level, supply is now barely adequate for demand, and in our so-called Group I Areas the demand exceeds the supply, which requires a determination of the relative urgency of products and services both nationally and locally. What is needed from a particular community? Is it ship parts, planes or guns? Is it steel or copper? Determination is made by the community in consultation with war procurement and other governmental agencies involved.

Having in mind the need for the product, our third point then is to determine who shall get workers. Our representatives sit down with employers and map out with them their labor requirements for two, four and six months in advance all in terms of their production schedules.

Our fourth point is to improve utilization of workers now employed. We examine into bad personnel practices and faulty scheduling of production. We look into and point out to those concerned bad housing, inadequate transportation, lack of adequate health facilities, the reasons for high rates of turnover and absenteeism, and so on ad infinitum.

Our fifth step is channeling the workers to the right jobs, i.e., to those that have top priority in terms of urgency of the product and in the ability of the employer to use the workers effectively. This step you know of variously under the heading of Controlled Referrals, Employment Ceilings, issuance of certificates of availability, and manpower priorities. They are not new and they are not

strange. They are tools. They are common sense means worked out by hometown management and labor officials for getting the right workers into the right jobs at the right time and keeping them there.

Progressing from the five steps enumerated, we find in many communities the supply of available labor is still inadequate. As a sixth step we then resort to curtailment of contracts being let in that particular community. For every contract is like a bank draft—it is a check drawn on labor supply of that locality. Obviously new contracts are and must be allocated to loose labor market areas, so that workers in those areas can be used. We therefore provide that checks be not drawn on the manpower bank if the account is already overdrawn.

The seventh step stems from the fundamental premise that the national manpower problem is a composite of local problems. This being true, it follows that to solve the national problem we must begin at the root and solve each of several hundred local problems in the locality in which they exist. In so doing we have arranged for the advice and assistance of management and labor through what is known to you as War Manpower Commission Area Management-Labor Committees. This pattern is followed from the area to the state, from the state to the region, and from the region to the national level, where we have available to us such outstanding representatives of industrial management as Mr. Eric Johnston, president of the United States Chamber of Commerce; Mr. Fred Crawford, former president of the National Association of Manufacturers and Mr. Conrad Cooper, vice president of the Wheeling Steel Corporation; from Labor, we have Mr. Howard Fraser of the Railroad Brotherhoods, Mr. William Green of the American Federation of Labor, and Mr. Philip Murray of the CIO; and from Agriculture, Mr. Albert Goss of the Grange, Mr. Ed O'Neal of the Farm Bureau Federation, and Mr. Jim Patton of the Farmers Union for Management. No doubt many of you here serve on some of our committees and appreciate



more than your colleagues the significance of what I am saying.

We call this our seventh step, though in fact it really isn't. It is a principle of procedure founded on common sense and logic—that the responsible manpower agents of the government tell the people what has to be done, when and where it has to be done, and leaves to them the determination of how it should be done.

Requirements of the Mines

You gentlemen have been both considerate and patient in bearing with me thus far, but I rather suspect that there has arisen in more than one mind the question of just how does this affect "Manpower for the Mines," which according to your program I was asked to discuss! By that invitation, you asked for it, so here it is:

The mining industry in the west, and for that matter throughout the nation, is one of our worst headaches, and one to which we have given longer and more devoted attention than to any other. Along with logging and lumbering, non-ferrous metal mining in the west, was made the subject of the first nation-wide stabilization order issued by the War Manpower Commission. This action helped but did not furnish a satisfactory solution. The next step was the release of some 4,200 soldiers in October, 1942, to stop the dangerous downward curve of employment in non-ferrous fields. We tried to get Mexican nationals for those mines along the southern border, but for various rea-

sons, including among others the opposition of the Mexican government, our efforts were unsuccessful. Preferential Selective Service treatment was extended not only to the non-ferrous mines but to coal mines.

You did what you could, but you too were confronted with many obstacles. First and foremost were the traditional wage rates in the industry, which placed you at a great disadvantage so far as aircraft, shipbuilding, construction, et cetera were concerned. Working conditions in your mines are typically hot, heavy and dusty, and generally unpleasant. You are located in remote and mountainous districts which offer too little in the way of comfortable housing, adequate transportation, community facilities, opportunities for recreation, or for shopping, medical care, schools, et cetera. Arrangements were made for federally financed housing projects, but these too encountered many obstacles and your people were still being hired away from you.

However we labored, the situation still grew worse so that between the months of July and September, 1943, an additional 4,500 men were released from the Army for service in the non-ferrous mines. At that time we found it necessary to request the War Production Board for a classification of the various mines in accordance with the urgency of their end product so that we could more intelligently direct the assistance being given them by our U. S. Employment Service.

Non-ferrous Metals Today

The situation now is that the production of non-ferrous metals is adequate and the limitations on the sale of molybdenum, vanadium, tungsten, and antimony have been removed. Our copper stockpile has been increased. We have a breathing spell but we cannot be complacent. Any change in war requirements will put us right back where we were and I cannot too strongly urge that each and every one of you concerned with non-ferrous mining give continuing attention to any and all actions that you have heretofore taken to reduce turnover and high rates of absenteeism, that you secure the maximum utilization of every worker you employ, and that you use them at their highest skill. I would also remind you of the continuing importance of adequate housing and transportation; of concerning yourselves with whether your workers can conveniently handle their community problems of shopping; of visiting rationing boards; of consulting with Selective Service officials, etc., at hours which will not interfere with their work. And remember that nothing contributes more to the twin evils of high turnover and absenteeism than inadequate parking facilities, lack of suitable eating arrangements and failure to provide school facilities for the children of your workers.

Approximately
2,300 skilled
and job-trained
workmen are
needed to
maintain
copper mining
operations at
Bingham Canyon



—Courtesy Explosives Engineer.

Coal Shortage in West

Lest I be accused of being too partial to the non-ferrous miners, let me hasten to add that one of the most acute labor problems confronting the country today is that of increasing the output of your western coal mines. The demand for coal in the western states this year will exceed probable production by about 4,500,000 tons. The congested condition of western railroads, and the additional load that expanding operations in the Pacific area will soon place upon those same railroads makes it imperative that every ton of coal possible be mined in the west this year. Lack of time prevents my going into detail as to the steps taken, but I can assure you that the Commission, in conjunction with the Solid Fuels Administration, is now working on a program to that end which has the approval of both labor and management. One item of interest to you in this program is the fact that through it we hope to make 1,000 to 1,500 experienced miners now working short weeks in the east and middle west available to be hired by western operators. In addition to that, we propose:

1. The publicizing of the basic importance of coal mining in the war effort.
2. An effective and continuing recruiting program.
3. Stabilization of the present working force, and
4. Maximum utilization of all available workers.

We have the responsibility for insuring the effectiveness of this program but *cannot* however be successful unless we receive—and we know that we will—full and complete co-operation of the operators. In passing, I may also add that the coal mining industry in the west has almost every drawback already mentioned as being detrimental to recruitment for non-ferrous mining. The mining of iron ore, as most of you know, is included in our list of essential occupations along with the other metals I have discussed. Your labor problems however have not been sufficiently acute to necessitate the same concentration of effort as was made for non-ferrous activities, or as is now being made for the coal mines. However we must recognize that increased steel operations in the west may place even further demands upon your iron mines and that the present situation may not continue. If such should prove the fact I can assure you that our Employment Service will accord you full cooperation.

The position of silver mining is dependent primarily upon the war contribution of a particular mine. This principle was established in July, 1943, with the development of the Miners Classification List. I am in

no position to discuss your all-over problems.

Only the fortunes of war can determine when gold mines will again receive any manpower recognition. If you can tell me when the war will end, I can then make a pretty accurate forecast as to when the restrictions from which you are suffering will be raised.

No More Soldier-Miners

I wish it were possible to give you some hope that the difficulties you now encounter in securing and keeping your personnel will be alleviated at an early date. Frankly I cannot. It's my considered opinion that the War Department will not approve any additional releases for work in the non-ferrous mines. I am equally convinced that there will be no cut-backs in the manpower requirements for many months and probably a year or so to come.

I would also warn you against being too hopeful when you see in the newspaper headlines such things as "Cut-Back in Tank Plant Throws 4,000 Men Out of Work." This will happen due to changing needs of the war, but each time so far—and we fear in the future—that this has occurred there has been a corresponding increase in demands elsewhere. For example, the total of all Army cut-backs has been more than compensated for by additional requirements in the airplane program alone. The cut-backs get the headlines; the increased demands do not, usually due to military necessity.

National Service Legislation

You will now ask me how does the President's request for National Service fit into our program. What happens if such law goes into the statute books? We cannot answer that in the absence of detailed provisions of the legislation. The Congress will have to give the final answer. We do know that the seven-point program outlined earlier is sensible and workable, law or no law. We also believe that any law to be passed should meet the following requirements:

1. Manpower is a problem of community organization. Broad discretion should be left to the state and to

the community to tailor the local manpower program to local needs.

2. Cooperation between management and labor should underlie the administration of any manpower law, just as it bulwarks the voluntary system.

3. The main problem is not to have the power. It is to have the facilities and the technical organization to administer that power wisely.

For manpower is a constructive problem of administration, not the exercise of penal restrictions. A law without the basic organization, for budgeting community manpower, for recruiting, placing, training and improving the utilization of workers, would accomplish nothing. Without a law, we have, together, accomplished much.

4. A law should be democratically administered. It must protect both worker and employer against arbitrary action. In the interest of efficient production it must recognize a maximum freedom of choice compatible with the emergency.

5. A law should recognize that authority brings obligation toward those whose lives have been controlled and toward their families.

6. A law should not be used to cloak inequity, injustice, or incompetence on the part of either management or labor, when those conditions impede the war effort.

The President in his message recognized the principles I have enumerated. Under these principles we have no hesitancy in anticipating a continuation of effective local manpower plans all operating to produce the ultimate goal of complete and lasting victory.

In conclusion I would remind you that there is now no such law and that neither I nor my colleagues of the War Manpower Commission have set ourselves up as sooth-sayers to say when there will be such a law. We do know that it is our responsibility and your responsibility to continue meeting the day to day problems and solving them as we now are. Production schedules must be met now, for our armed forces and those of our Allies cannot wait. The flow of their supplies and equipment must continue regardless of what the national manpower control is or may in future be.





Charles Dorrance
National Chairman
Program Committee

Coal Mine War Conference

**Netherland Plaza Hotel, Cincinnati,
May 1 and 2.**

THE 1944 Coal Mine War Conference of the American Mining Congress will be a two-day meeting—Monday, May 1, and Tuesday, May 2—at the Netherland Plaza Hotel, Cincinnati, Ohio. Sessions will be held on the morning and afternoon of each day to discuss problems of coal production—bituminous and anthracite from deep mines and open pits.

Preliminary plans for the Conference were made at a series of district meetings of the Program Committee, held during the month of February in various coal centers—Terre Haute, Chicago, Pittsburgh, Lexington, Ky., and Clarksburg, W. Va., where it was recommended that the procedure which has made the Conferences of the past two years so successful should be followed again this year. Accordingly, there will be general sessions for subjects which apply to all branches of mining, and there will also be separate sessions for strip mining and for special phases of deep mining. In addition, luncheon meetings on Monday and Tuesday will have discussions on topics of wide interest to the industry, and the Annual Dinner Tuesday evening will feature a guest speaker of national prominence.

In view of the fact that no new machines have been designed since Pearl Harbor, the big job of the coal industry has been to speed up production to unprecedented heights with 1941 models. This job is being done, in spite of equipment and labor handicaps. Some of the methods are strictly war measures, while others will have a post-war use, but in either case, the way in which this record tonnage is being mined will be the underlying theme of the Coal Conference in Cincinnati.

State Chairmen

Pennsylvania



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Consulting Engineer

Ohio



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Lorain Coal & Dock Co.

Indiana



P. L. Donie
Mariah Hill Super Block
Coal Co.

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Superior Coal Co.

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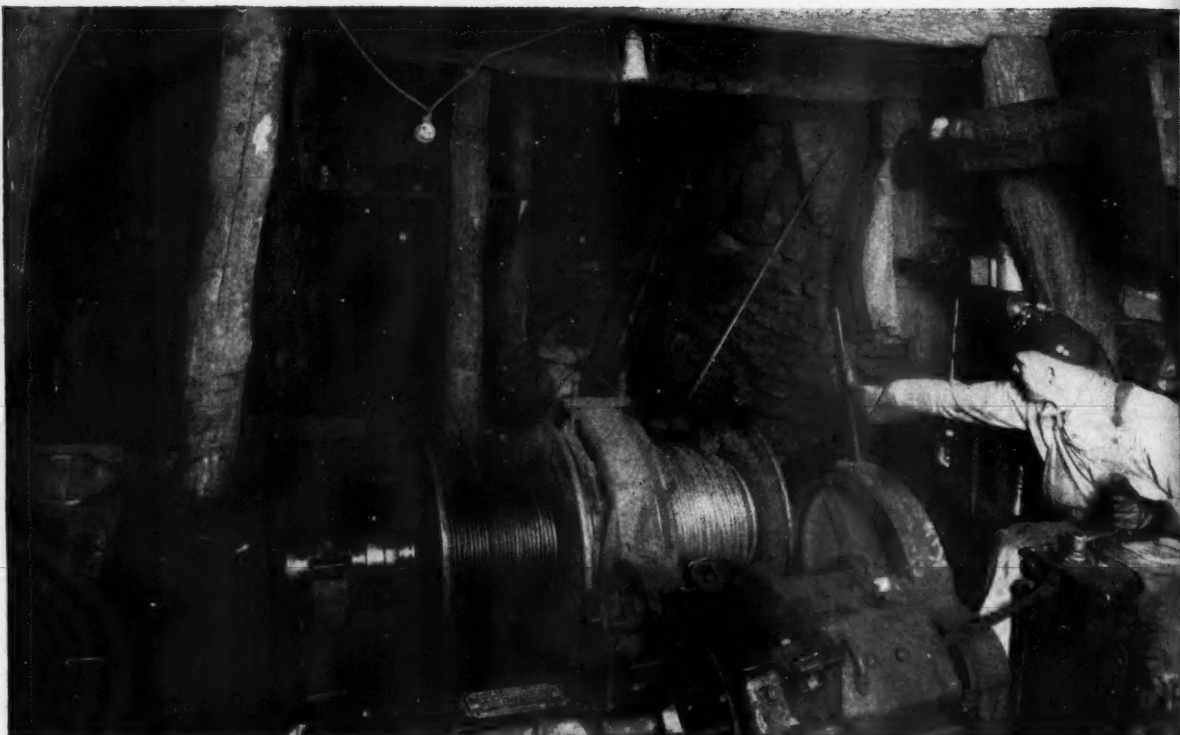


Alex Grant
Rocky Mountain Fuel Co.

Strip Mining



Hugh B. Lee
Maumee Collieries Co.



A WAR MESSAGE... To The Man Behind The Throttle

Wartime calls for extra deftness in your throttle hand. Not only is it vital to the war effort to get more work out of your machine but at the same time do it with the least wear and tear.

Wire Rope especially must be given every possible care in order to last just as long as it possibly will. The chance of replacing wire rope is apt to continue limited. Great quantities of it still must be produced for our armed forces. As our offensive power gains momentum and invasions increase in number and scope, the greater becomes the tonnage of war materiel which must be hoisted, handled, loaded and unloaded all around the globe.

In the white heat of battle when lives depend upon it, wire rope must take abuse necessitating replacement long before its time. So it is that the important matter of conserving wire rope falls heavily on the throttle hand of users on the home front. To help you save wear and tear on your wire rope and keep it working, Union Wire Rope engineers have prepared and offer five different booklets entitled: **1. Correct Handling of Wire Rope. 2. Lubrication of Wire Rope. 3. Splicing Wire Rope. 4. Socketing Wire Rope.** These give you specialized

information. **5. Rope Dope** amplifies on abuses of wire rope and the remedies. All are written in non-technical terms. Put into practice, the information contained in these booklets will help you contribute to the war effort now by conserving wire rope and it should stand you in good stead in safer and more satisfactory wire rope operation post-war. All are FREE for the asking. A penny post card request will bring any or all of the booklets.



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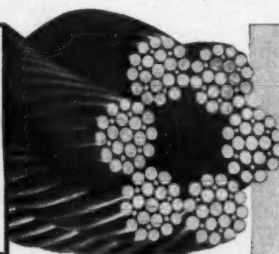
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British Official Photo.

BORDEN, Britain's undersea colliery, yields 5,000 tons of coal per week from underground workings running nearly three miles out to sea

A COMPLETE cross-section of young Britain will soon be working in the coal mines. Labor Minister Bevin has been considering compulsory direction of men to the pits for some months. In December he put forward a ballot scheme which will decide those who are to be drafted for work in the mines.

Men in the selected age groups will have the last figure of their military registration number—0 to 9—put in a hat. Those drawn that agree with the selected number will be drafted. The numbers will be picked by a junior girl clerk at the Labor Ministry, under the direct supervision of Mr. Bevin. Although the 30,000 men required immediately, and a further 20,000 to replace the annual wastage, will be taken mainly from the 18-year-olds, some men up to 25, whose deferment from national service has expired, will be included.

Production Adjustments

Many of the problems which Britain's coal mining faces today are the results of the extraordinary vicissitudes which have beset it during the last 25 years. Between the two wars, despite increased world consumption of fuel, demand for British coal fell by some 25 per cent. Many pits were closed and the remainder given a quota of production below their capacity.

Many skilled men left the pits and the industry only survived at a level of prosperity too low to attract men to its service if other employment were available.

Britain's Coal Mines In Wartime

By R. H. WALKERDINE

Editor

British Colliery Guardian

With the outbreak of World War II demand rose at once since it was clear that France would need vast quantities of British coal to replace the fuel she had hitherto imported from Germany. This new demand chiefly benefited the exporting districts—districts which had suffered most severely in the slump.

This compensation was short-lived and in the summer of 1940 a substantial proportion of the available overseas demand for British coal disappeared overnight. Again the exporting areas of South Wales and the North East Coast were the main sufferers. Pits had to go on short time and a large part of the labor force left the industry.

It was clear then, of course, that ultimately all possible production would be needed from British mines but at the time no arrangements existed for maintaining these men in the industry. In the summer of 1940

Britain had even more pressing problems to solve than the accurate estimation of the probable coal needs in the fourth or fifth year of the war.

Attempts were made to help the exporting districts by granting them a share of the home market. This facile solution at first proved difficult to operate in practice for all existing transport arrangements were planned to take the coal from the pit to the docks and it was some time before the heavily burdened railroads were able to organize a flow of coal in the opposite direction.

Coastwise trade was maintained but the necessity for sailing in convoy as a protection—an incomplete one—from the enemy aircraft and E-boats considerably reduced its capacity. However, the transport position has continuously improved and at the present time, whilst coastal traffic has regained some of its old importance, the railroads are generally able to

maintain a fair supply of wagons to the mines.

Roof Support Materials

First supply problem was pit props. Before the war the greater part of the timber used in British mines came from Finland. The closing of the Baltic at once cut off this source of supply. Unfortunately in 1939 stocks of timber in Britain were not large owing to the exceptional variations in price which had taken place a few years earlier.

A timber control was early inaugurated and arrangements were made to increase the supply of French and Portuguese pit wood but there still remained a substantial gap to be bridged. Some supplies were received from North America but the shipping position prevented material expansion of this supply.

In 1940 great efforts were made to economize in timber consumption. The obvious substitute was steel and managers were encouraged to use steel props at the face and steel arches in the roadways. Both these forms of support were already common but in some mines the workers were prejudiced against them. This was steadily overcome in those pits where conditions permitted the use of steel but the change-over added to the managers' problems.

In an attempt to economize steel, many patterns of concrete supports were devised. These, however, have proved unpopular and generally unsatisfactory at the face. Today their principal use is in settled ground. In spite of the immense stimulus of shortage of supplies, no new patterns of supports have achieved popularity. Various types of yielding prop have been used but, in the main, the plain joist is first choice. On the roadways concrete and brickwork have been used as fillings between arches instead of timber.

The position would have been precarious if home-grown pitwood—an almost unknown commodity in peacetime—had not been available. The work of Britain's Forestry Commission, in planting trees during the period between the two wars and in assisting the owners of private woodlands, has been of immense benefit to the mining industry. Home-grown timber has replaced a large part of the imported commodity with entire satisfaction.

Although at the moment the mining industry has no serious support problem, this happy state of affairs cannot long continue. British forestry is a recently revived industry and in order to maintain supplies has been forced to produce at a rate which cannot be indefinitely maintained. At some time during 1944 the flow of supplies may begin to dry up. Steel, despite other heavy demands, will

have to be used in conditions which are not now thought suitable for its employment unless some outstanding military achievement re-opens older sources of timber supply to the British market.

Mechanical Mining

Although provision of machinery in mines has been at times subject to delay it has never been in acute shortage. When Malaya fell tighter control was put on rubber consumption but this was never so severe as to handicap working. Shortage of belts, however, has encouraged some ingenious improvisations.

Belts that would at one time have been scrapped are now being cut up and the good parts stitched together again. Thus belts with longitudinal seams are commonly used and the machines kept at work. Early in the war a pool of British coal face machinery was started but it has been little needed and rarely used.

Underground mechanization has been increased to improve output but the increase has served only to maintain production in the face of other debilitating factors. Since the thicker and shallower seams became exhausted natural conditions forced the adoption of a closely-timbered long-wall method of working in British mines. With the development of machinery suitable for it this method of working came to be adopted even in some districts where the natural conditions would have allowed pillar and stall working to be continued.

The standard British system on a mechanized face is to undercut the coal with a long-wall machine, blast it and load it by hand onto conveyors. In 1938 59 per cent of the output was cut and 54 per cent of it conveyed.

These proportions have been increased during the war to 66 per cent cut and 65 per cent conveyed. Allowing for the fact that natural conditions prohibit the universal application of machines, the scope for further improvement is limited. Within that limitation efforts are being made to boost output by further mechanization.

The weak link in the chain of mechanization is undoubtedly loading. Many attempts to devise a new machine to do this work or to adopt American plan to British arrangements have been made but complete success still awaits the pioneers. The British Meco-Moore cutter loader designed before the war, cuts the coal in three planes and by means of a rotating hooked bar, rolls it onto a cross conveyor delivering onto the face conveyor.

This is a most ingenious machine but has proved satisfactory only in certain conditions. High hopes however are entertained for the latest design. A machine designed since the war is based on the long-wall coal cutter. In place of the normal jib and chain is a unit having vertical flights in place of picks. These flights push the cut and blow coal up a ramp onto the face conveyor. Other machines working on a similar principle have also been built. These machines are operating successfully at several collieries and further reports of their progress are awaited with interest.

American Equipment

It is clear, however, that developments of British machines alone may not be fast enough to provide the increase in output required in the emergency of war. A ready-made system of complete mechanization that can be put into immediate operation is re-



British Official Photo

British mining family. George Holt, his two sons and son-in-law all work the same shift at South Kirby pits near Leeds. Grand-daughter Doris works in company office

quired. For this reason American methods and machines have been considered afresh in the light of British conditions.

After this re-examination it has been estimated that about 20 per cent of British workings are suitable for working by stoop and room with American plant. Arrangements have been made for the supply of American cutters and loaders and underground places prepared for them. The machines received are already at work and it is expected that when the heading work is completed in the near future these machines will be producing coal at a rate much greater than any hitherto achieved in Britain.

Delivery of further machines is expected and these have all been allocated to pits where the preliminary lay-out of the workings has already been completed. Immediately the loaders and cutters arrive they will be put to work. In some cases these innovations will require alterations to existing haulage arrangements and it is hoped in some cases to use American shuttle cars.

Open Pit Development

During the last 12 months opencast mining has got into its stride and coal from strip pits is already making an important contribution to the national need. The quality of opencast coal is inferior to that of deep-mined coal and it is found in relatively small areas, but a large number of sites have been opened. Some workings have already been completed and the land restored to agriculture.

It is expected that the planned output of 3,000,000 tons from opencast working in 1943 will be exceeded. In 1944 it is hoped very considerably to increase this output if the machines are available. A possible production of 10,000,000 to 15,000,000 tons having been mentioned by Mr. Churchill.

Col. G. W. Parkinson whose firm has already produced 1,000,000 tons said recently that outcrop workings could produce at least 10,000,000 tons of coal a year for several years to come. Present output, he said, was being obtained from 150 machines and he understood that arrangements had been made for the supply of a further 250 diggers. These, it is expected will be American machines.

From this it will be seen that technical wartime problems in the mining industry have been largely solved, even if in some cases the solutions are only temporary.

Manpower

So far as manpower problems are concerned, some still remain, but taking the broad view, the effect of these on the war effort has been limited. From its position as a decaying industry the coal trade has been re-

The best
British
coal comes
from
underground
mines



British Official Photo.

stored to something nearer its appropriate level as the prime basic industry of Britain. The position of the men has been greatly improved by raising wages and by other means. The wage awards comprise a sliding scale guaranteeing an advance in wages to correspond with increased cost of living; an attendance bonus of one shilling per shift; the Greene addition of two shillings and sixpence per shift, an output bonus and a guaranteed week at a minimum of 83 shillings for underground workers.

Hours have remained at seven and one-half per shift, thus from a monetary point of view the miner is now in a position at least as advantageous as that of industrial workers generally.

Government policy is to provide industrial workers with the opportunity of obtaining food additional to the normal civilian ration through the medium of canteens at the place of work. For this purpose pithead canteens have been provided wherever there has been a demand from the miners, and these canteens, in common with all canteens serving workers in heavy industry, are allowed rationed food on the highest scale permitted by Britain's Ministry of Food.

The service afforded by the canteens falls into three categories — packed meals, snacks and light refreshments

or a combination of full meals and the other services — according to the wishes of the miners.

Ninety-five per cent of the men in Britain's mining industry have been catered for and the percentage having full meal canteens is already 50 per cent and is steadily rising. Canteens are well patronized, the daily average number of men using them being in the region of 75 to 80 per cent of the total employed.

Another valuable amenity provided during the war is a number of rehabilitation centers for seriously injured miners based on the one started and most successfully operated by the Midland Colliery Owners and Miners at Mansfield. Here 95 per cent of the patients are restored to working fitness. That center has lately been taken over by the Miner's Welfare Commission.

Britain's Ministry of Fuel and Power has also inaugurated a medical service for the miners and nine doctors, one in each region and one at headquarters have been appointed to guard the miners' health and supervise first-aid arrangements.

The Minister of Fuel has reported that no essential work or plant has had to stand idle because of shortage of coal; no mean achievement in four years of sustained effort and lack of entertaining leisure.

Centrifugal Refrigeration in Nitrate Processing

*Industrial process heat balancing forms the basis for
selection of refrigeration equipment*

By W. B. BRAXTON

Engineer, International Division
Carrier Corporation

THE Cia Salitrera de Tarapaca y Antofagasta operating in the northern part of Chile, recently installed new equipment to improve the yield and reduce the operating cost of their nitrate refining process. This company handles approximately 30 per cent of the Chilean nitrate production, obtained at present from lower grade ores than had originally been available; the original "Shanks" refining process no longer proved profitable and it was decided to adopt a modified "Guggenheim" process which requires refrigeration of a brine solution during crystallization, simultaneously heating the mother liquor being returned to the leaching tanks. The average amount of saltpeter ore handled daily is 7,000 tons which yield 500 tons or more of refined nitrate. The magnitude of these operations indicated that a very close study of the heat balance of the process would yield appreciable operation economies. In this case the problem was further involved by the need to use present equipment and available facilities to the greatest extent, to reduce the critical materials to be purchased. The final conclusions dictated the use of centrifugal compressors as being the most flexible and suitable for the operation of the system, while steam turbines though ideally suited for driving such compressors, did not prove to be the best solution in this case due firstly to the present availability of diesel generator sets provided with waste heat recuperating facilities and secondly, to the physical layout of the plant.

The flow of materials consists in general of feeding crushed saltpeter ore grading from $\frac{1}{4}$ -inch to 30-mesh to the main leaching plant, while ores smaller than 30-mesh are handled by the "fines" treatment plant. The leaching plant ores contain approximately

13.75 per cent of soluble salts. The residue from this plant contains approximately 1.45 per cent salts. The "fines" treatment plant soluble salts concentration in the saltpeter ore is approximately 20.20 per cent while the residue contains 6.45 per cent salts. The overall extraction of nitrate from the saltpeter ore is approximately 90 per cent, while the refined nitrate contains 99.6 per cent NaNO_3 .

The leaching plant is provided with the usual head, feeder and wash tanks for concentrating the warm mother liquor before sending this to the crystallization plant. The strong solution leaving the main leaching plant contains approximately 450 grams of

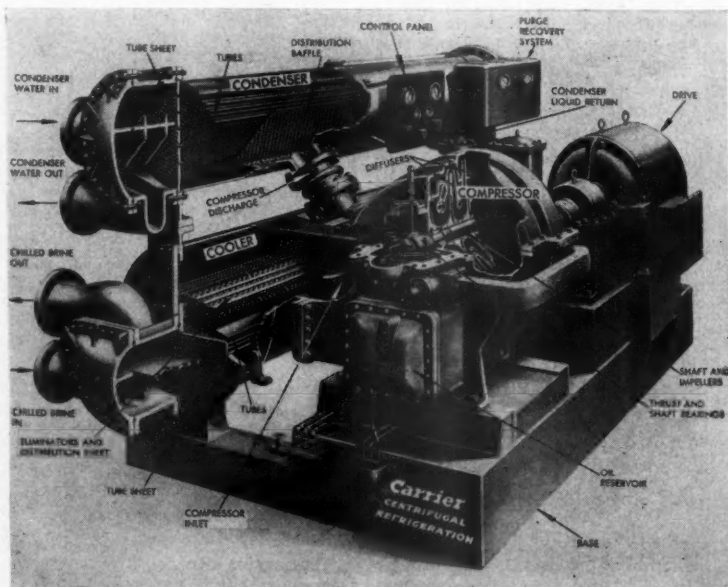
sodium nitrate per liter, 200 grams of sodium chloride per liter and from 15 to 30 grams of sodium sulphate per liter, together with traces of iodine. The temperature of this strong solution will vary from 110° to 120° F. and is introduced into a series of tanks forming the crystallization plant. In this particular instance the total number of tanks is seven—each one having three outside heat interchangers, causing the solution to be cooled and supersaturated before coming in contact with the nitrate crystals maintained in suspension in the tanks.

The first few of these tanks are cooled by the weak mother liquor which brings the strong solution down to 68° F., then by cooling tower water to a lower temperature and finally, in the last tanks, 32° F. sodium chloride brine from the coolers of centrifugal machines is circulated through the heat interchangers, bringing the strong solution to a final temperature of 37° F.

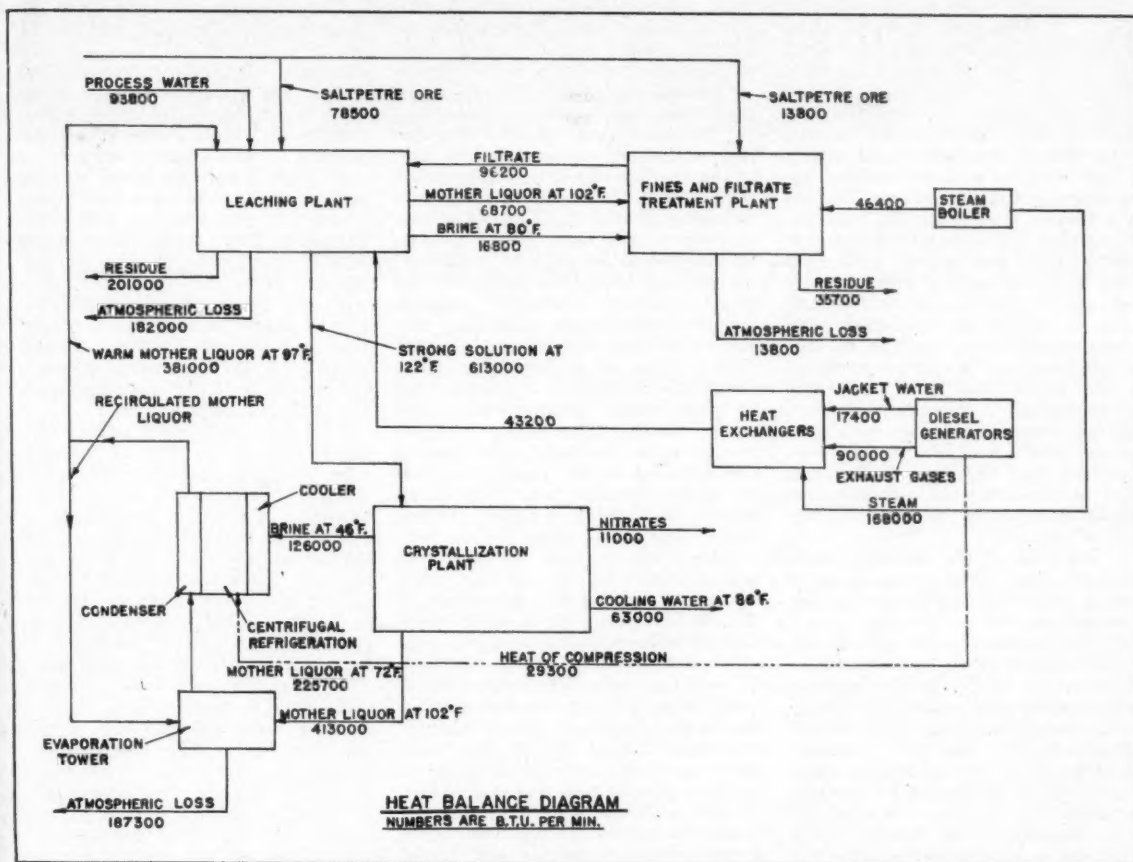
The entire cooling cycle, known as the Swedish Kristal patent, is slow to promote the growth of large crystals which are easily removed from the tanks by syphoning the finished crystals into the receivers of basket type centrifugals.

The weak mother liquor is then sent through the condensers of the centrifugal refrigeration machines on the way back to the heating plant, thus being partially heated by means of the waste condenser heat.

The foregoing description gives a general idea of the process involved and indicates the function of the refrigeration equipment in the system about which this particular study is concerned. Earlier plants had used



Carrier centrifugal refrigerating machine



ammonia for refrigeration in this type of work, since the use of centrifugal compression using non-toxic refrigerants had not yet been widely applied in industrial processes. However, such an ammonia reciprocating compressor installation after thorough consideration of the earthquake locality in which this equipment was to be installed, would prove extremely hazardous and could not insure continuous 365-day per year operation, due to the danger and possibility of earth tremors breaking liquid lines or other long runs of pipe, which would entail long shut-down periods due to the remoteness of suitable service and repair facilities from the site. The use of a compact refrigeration system which would insure against possible loss of refrigerant was imperative. The carrier centrifugal compressor answered this and other requirements, since the refrigerant used is non-toxic and non-flammable and the machine is built so as to practically eliminate all refrigerant interconnecting lines. Even if a break in the refrigeration system did occur, the pressure-temperature characteristics of the refrigerant are such that, no danger to personnel would ensue or very little would be lost before the

charge could be poured into storage drums.

It is interesting to note that the Carrier centrifugal compressors not only offered the above advantages, but import duties, freight and handling charges for this equipment, which are all proportional to weight, were considerably smaller than would have been the case for an equal capacity ammonia reciprocating plant.

The question of the necessity of a spare machine in this case was not determined by the reliability of the centrifugal compressor, but on the fact that the condenser tubes which would handle mother liquor would necessitate cleaning at certain intervals and it was deemed advisable, therefore, to install the requisite refrigeration capacity in multiples which would allow time for cleaning the tubes on one machine without reducing the crystallization capacity of the process.

Preliminary studies of total price of the equipment indicated that two centrifugal machines, each one carrying half the load, and one identical spare, would prove to be the most economical solution.

Once the decision as to the type and number of centrifugal machines had

been made, a detailed study of the heat balance of the process when using electric motor or steam turbine compressor drive was advisable. The refrigeration requirements would be relatively constant from day to day, but certain seasonal and long-time variations would occur, due to atmospheric conditions and fluctuations in the composition of the saltpetre ore handled. This meant that the driving equipment had to have sufficient flexibility to avoid any waste of heat when operating, under all the various combinations of atmospheric conditions and crystallization temperatures at which the machinery would be operated. If steam for process heating were obtained from the steam turbine, increases in nitrate production due to richer saltpetre would require more refrigeration and greater horsepower loads, but since the tonnage of saltpetre handled is constant, the heat demands of the leaching and fines treatment plants would be relatively constant, necessitating relatively low turbine water rates at such times. Furthermore, such process steam would be required both at the leaching and fines treatment plant.

The fines treatment plant requirements when heating the mother liquor

to a probable maximum temperature of 185° F. from 100° F. would necessitate that the turbine exhaust be at a relatively high pressure, in order to satisfy these temperature requirements, as well as overcome the friction drop in the line from the turbines to the "fines" treatment plant, which, in this case, were to be installed approximately 2,000 ft. apart. The use of a bleeder type of turbine was considered for this service, but the possibility that the "fines" treatment plant would be operated intermittently and possibly not at all in the first years of the process, indicated that, unless considerable savings by the use of steam turbine drives appeared in the calculations, these would not be considered. Preliminary studies did not substantiate any such conclusions and it was deemed advisable, therefore, that the "fines" treatment plant be provided only with steam at 220 lbs. gauge from the existing "Lancashire" boilers.

In the case of the leaching plant, however, the heating requirements were at lower temperature levels than those encountered in the "fines" treatment plant, which might permit the use of exhaust steam from turbines. The average yearly heating requirements studies were based on operating the crystallization plant in the range extremes of 50° F. and 60° F. assuming an average annual ambient temperature of 67° F. Heat for the leaching plant was available first of all from recovery units handling the jacket water and exhaust gases of the existing diesel generator installation, at the rate of approximately 3,300 B.T.U.'s per kw.h. from the jacket water and 1,700 B.T.U.'s per kw.h. from the exhaust gases. These figures taking into consideration approximately 10 percent loss. The balance of the heating requirements could be supplied whether directly from the oil-fired "Lancashire" boilers with steam at 220 lbs., or alternately from turbine exhaust steam; in the latter case it would have been advisable to add superheaters and standby capacity to the present boiler installation if turbine drives were adopted and, consequently, unless considerable savings in operation were indicated on paper the use of turbine drive could be disregarded.

The total daily power requirements exclusive of the refrigeration plant averaged 60,800 kw.h., which translated into heat available from the recovery units amounted to approximately 210,000 B.T.U.'s per minute available for process heating in the leaching plant. The average daily heating requirements of the leaching plant are indicated on the attached heat flow diagram at 432,000 B.T.U.'s per minute, which would require that the exhaust steam from the refrigeration machine provide 222,000 B.T.U.'s per minute.

In order that the overall quantity of fuel burned could compare with the present diesel generators and waste heat recovery units, it was necessary to assume that steam for operating the turbines would only be condensed for process heating and not in a special condenser; consequently in view of the average 650 BHP refrigeration requirements the weight of steam representing 222,000 B.T.U.'s per minute at exhaust conditions would necessitate a turbine water rate that could not be practically obtained with the steam conditions available. Another possible solution was to use one machine with electric drive and one with turbine drive, or a third solution to use all electric drive. It must be kept in mind that in this installation, due to the diesel engine waste heat recovery units, the larger the electric load imposed on the diesels, the less the heating required from direct steam supply or turbine exhaust. When using all electric drive, which incidentally, was the final selection, the heat available for process work from the diesel generators amounted to 264,000 B.T.U.'s per minute, while the oil-fired boiler installation would only supply 168,000 B.T.U.'s per minute to the leaching plant. The final criterion in the selection from the two possible combinations, namely mixed electric and steam for all electric drive, was the total daily oil fuel consumption for the diesels and boilers, which, coupled with the considerations of standardizing on a type of drive, would give the desired answer; in the case of mixed drive the total daily average oil consumption worked out to be 72,500 lbs. as against 75,000 lbs. in the case of all electric drive when operating at 60° F. crystallization temperature. However, at the lower crystallization temperature of 50° F. the difference in oil consumption favored all electric-drive. Since all indications were that the plant would normally be operated at the lowest practical crystallization temperatures, the Cia Salitrera de Tarapaca y Antofagasta decided to install all electric drive machines.

Palladium Finding Wider Use

1943 has seen increasing use of palladium and ruthenium, Charles Engelhard, president of Baker & Co., Inc., states in his annual review of the platinum metal group.

Palladium has experienced a very active demand during the year, principally for jewelry, dental alloys and electrical contacts. Following restriction on platinum's use in jewelry, the trade and the public revived interest in white metal for modern jewelry. Palladium has benefited from this trend.

"While the demand for palladium has been unusual, nevertheless there has been a restriction in jewelry's use of the metal as well as gold because

Once a conclusion had been reached covering the electric drive, consideration was given to possibilities of improving the power factor of the generating system by the use of synchronous motors or the addition of capacitors. Centrifugal compressors operate at the greatest efficiency on part loads if variable speed, slip ring, wound rotor motors are used instead of constant speed motors with suction dampers. Since the partial load conditions were to be of long duration, the use of capacitors in conjunction with slip ring variable speed motors proved more suitable than synchronous motors, both from the efficiency standpoint and the ease in balancing the operation of the machines against the various load conditions.

The final installation consisted of three Carrier centrifugal machines, each having a capacity of 375 tons of refrigeration, two of which operate normally, the third being used for standby, so as not to impair the crystallization capacity of the plant, when cleaning the condenser tubes. Each centrifugal is driven by an Ideal electric 400 hp. Noel type variable speed type AVN, 80 percent leading power factor, wound rotor, slip ring motor. The machines cool sodium chloride brine from a temperature of 46° F. to 32° F. while the condenser of these machines heat mother liquor of 1.40 specific gravity from a temperature of 74° to 92° F. Special materials suitable for sodium brine or mother liquor were used for the tubes and tube sheets of the coolers and condensers.

The description of the flow of materials together with the study of the heat balance in this plant, indicate fully the reasoning which was followed for selection of the refrigeration equipment in this plant and illustrate the flexibility which centrifugal refrigeration machines and their drives provide for industrial process heat balancing. The reliability of Carrier centrifugal compression is a further guarantee of the continuous operation of the process of crystallization.

of the Government's desire to conserve manpower and employ precision machinery for war production. As a result of this curtailment it is reported the supply of wedding and engagement rings may be insufficient. In my opinion the Government will make adequate provision for additional metal should need arise.

"Ruthenium was one of the most interesting of the platinum metals during the year. It had been overshadowed by iridium as a hardener of other platinum metals. With the shortage which developed in the supply of iridium, the properties of ruthenium were investigated and this metal now fills an important position in the field of precious metal hardeners."



Coal Division Reports

Mine Roof Sealing to Prevent Slate Falls†

THE FIRST report on this project, as published by MINING CONGRESS JOURNAL in April, 1943, was made immediately after a sealing coat of asphalt paint had been applied to approximately 4,000 lineal ft. of entry and airways. Following this first inspection and report, the committee met on September 28 for a second inspection of the project, which then had seen service during the warm summer months. The sealing had not been entirely effective; portions of the sealing material, with more or less of the roof rock to which it was attached, originally had fallen in numerous places. The committee's discussions after the inspection were directed mainly to the causes of the partial failure. Those attending subsequently reduced their observations and ideas to writing; these are summarized as follows:

Second Mine Inspection

At certain points are clay veins or other structural disturbances of the roof that required timber support. At these points the roof is naturally wet and the sealing material is not effective, as would be expected. These minor areas cannot be considered.

There was a dead-end area in which the sealing material was in perfect condition and completely covered with large drops of water condensed from the air during the summer; these had not yet been evaporated by the cooler air of early fall. This led to speculation as to the possible role of temperature changes in the observed effects and to the possibility of moisture protecting the paint itself from atmospheric oxidation. However, there was near the shaft a 45-degree crosscut in which there was a strong current of air at all times and in which the paint was also in perfect condition. These two bits of evidence are somewhat contradictory, and a conclusion in harmony with both of them is difficult to draw.

There are evidences of oxidation

† Published by permission of the Director, Bureau of Mines, United States Department of the Interior.

* Member of Committee on Roof Action, American Mining Congress; Superintendent, Central Experiment Station, Bureau of Mines.

Prepared for the Committee on Roof Action, as a supplement to the report published in April, 1943

By H. P. GREENWALD*

(iron stains) along some of the surfaces from which the sealing material has become detached, and oxidation may be a factor in the case locally if not universally. There is some evidence that deterioration was worse where rock dust had been applied over the paint, but the evidence is not as clear-cut as could be desired and needs confirmation. It is not evident how rock dust could affect the material unless it absorbed the lighter liquid components thereof, with resultant hardening of the coating. Here, however, there is no clear evidence that hardening of the coating was an important factor, although it cannot be excluded completely from consideration.

Finally, it is known as a result of tests by the Bureau of Mines that the roof rock is highly variable in mechanical properties in short distances, that it contains numerous thin coaly inclusions along the bedding, and that these result in great weakness to tension perpendicular to and shear along the bedding.

Presence of Clay Veins and Fracture Zones

On December 11, 1943, Drs. A. J. W. Headlee and J. H. C. Martens, of the West Virginia Geological Survey, examined the structural geology of the painted area, which they found to be traversed with many clay veins. This inspection will be discussed in a separate report.

Tests By the Bureau of Mines

Two samples of the roof rock were obtained for test at the Pittsburgh station of the Bureau of Mines. The first sample was a slab 4 in. thick, which was obtained early in July, 1943; the bottom side had been coated

while in the roof. It came from a main entry within 100 ft. of the shaft. Proximate analysis showed 1.1 percent moisture, 13.5 percent volatile matter, and 82 percent ash; all of the volatile matter is not combustible, as it includes the combined moisture of the shaly material. There was 0.55 percent pyritic sulfur and only 0.01 percent sulfate sulfur. Total pyrite in the rock is of the order of 1 percent. The sample was medium- to fine-grained and poorly bedded. The organic material was of two types, thin coaly streaks mentioned above, some of them of microscopic size, and a generally distributed humic precipitate showing little if any vestige of original structure.

The second sample was taken some months later on the assumption that the first might not be representative of the roof rock as first uncovered by mining because of its long exposure to the mine-air currents. This second sample was taken at a point 1,900 ft. from the shaft and 600 ft. from the face of an advancing entry. A rectangular block 21.5 inches thick was cut from the roof above one rib and above the roof coal. The lower 5 to 6 in. of this section usually is taken down in mining, and for the tests reported here only the upper 15 to 16 inches of the sample was used. The second sample appeared more definitely stratified than the first and was not homogeneous. Some parts were of a smooth, gray texture and quite uniform in appearance, whereas other sections only an inch or two distant contained marked carbonaceous or coaly inclusions.

The examination of December 11 showed that the first sample was taken in an area free of clay veins in which the roof was quite good. The second sample was taken close to a

clay vein and within the accompanying fracture zone in the roof. These facts should be kept in mind in studying the results of tests made.

Results of Tests

Certain of the results obtained are summarized in Table 1. Before discussing them attention is called to some data not readily included in the table.

Moisture Content and Absorption.—On drying to constant weight at 105° C. the "as-received" rock (first sample) lost 2.12 percent in weight, presumably moisture. In a saturated atmosphere it gained 0.25 percent weight in 11 days and 0.35 percent in 33 days. A 2-in. cube thereof immersed in tap water gained 0.15 percent in 6 days. When removed and exposed to laboratory air for 27 days, this cube lost 0.67 percent weight. Evidently this rock is tenacious of its moisture, as the total after immersion was probably about 2.25 percent. A 2-in. cube from the second sample absorbed a little more moisture than did the cube from the first sample.

Expansion and Pressure Caused by Moisture.—Behavior of an "as-received" specimen cut from the first sample normal to the bedding thereof and exposed alternately to 100 percent humidity and that of the room is shown in figure 1, and that of a specimen alternately immersed in water and exposed to room humidity is shown in figure 2. The maximum change in length of specimen on figure 1 is about 0.7 percent and that on figure 2 about 1.1 percent. In these tests there was no restraint on expansion. When expansion is prevented by restraint, pressure is developed, as shown by the test data ob-

TABLE 1.—PHYSICAL PROPERTIES OF ROOF ROCK FROM THE PAINTED AREA

Item	First sample	Second sample
Average modulus of rupture, lb. per sq. in.:		
"As-received" rock, continuous and rapid loading	320	1,160
"As-received" rock, intermittent loading	200	
Dried rock, continuous and rapid loading	650	1,220
Partly dried rock, slow loading in air		1,100
"As-received" rock, slow loading in water		1,100
Modulus of elasticity, lb. per sq. in.:		
"As-received" rock, lower loads	1,930,000	1,180,000
"As-received" rock, higher loads	417,000	2,060,000
Dried rock, lower loads	1,500,000	2,000,000
Dried rock, higher loads	980,000	2,320,000
Compressive strength, lb. per sq. in.:		
"As-received" rock, normal to bedding	5,980	4,305
"As-received" rock, parallel to bedding	5,850	5,450
Tensile strength parallel to bedding, lb. per sq. in.		355
Thermal expansion, percent per °F.:		
Normal to bedding	0.0018	0.0018
Parallel to bedding	.0006	

tained on immersion in water and plotted in figure 3. Note the individual curves for total and unit pressure and also for "as-received" and dry rock. In neither case was the pressure sufficient to destroy the specimen.

Specimens were cut from the second sample also and subjected to the expansion test at high humidity and during immersion in water but were not tested for development of pressure. At high humidity the results were quite similar to those obtained with the first sample. When immersed in water a curve much like that of figure 2 was obtained but of greater amplitude. Contraction at the close of the first cycle was nearly 0.5 percent and expansion at the peak of the second cycle was 1.4 percent, values nearly double those of figure 2.

A specimen prepared from the first

sample was coated with paint and was then subjected to the immersion-in-water test. The paint coating eliminated 90 percent of the expansion and contraction.

Moduli of Rupture.—Values of this property obtained under a number of different conditions appear at the head of Table 1. The moduli of rupture for specimens prepared from the first sample indicated (1) that the "as-received" rock was quite weak in cross bending under rapid loading, (2) it was still weaker under sustained loads, because of plastic deformation with time, and (3) dry rock was roughly twice as strong as rock with bed moisture. Obviously coating cannot overcome the inherent weakness of the rock represented by sample 1. The increase in strength on drying (a usual thing with clays and shales)

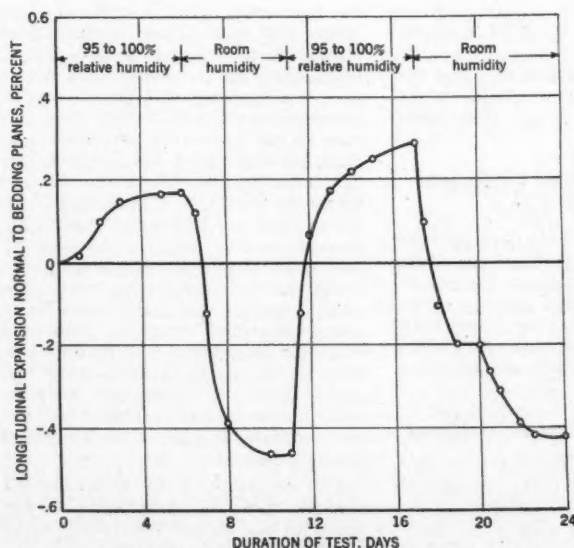


Fig. 1. Expansion of shale with varying humidity

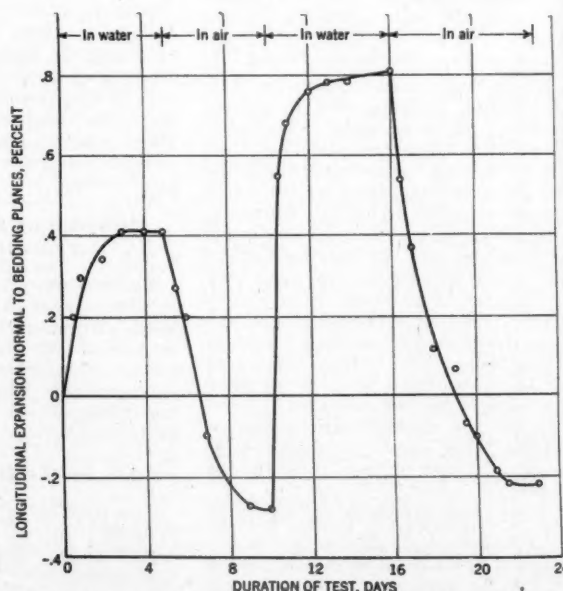


Fig. 2. Expansion of shale during alternate immersion and drying

permits an explanation of spring roof falls under certain conditions. It is safe to assume that mine roof composed of inherently weak material is loaded close to its breaking stress much of the time, particularly when falls (even of small magnitude) occur more or less periodically. If an increase in strength accompanies drying during the winter a greater load can and may be supported. On return of spring the rock reabsorbs moisture and loses strength, and if it is then overloaded, there is continued collapse, layer by layer, until the stress is relieved.

The possibility that plastic flow is a factor in the case made desirable more detailed investigation of this point with specimens from the second sample, but the data in Table 1 show that these specimens had properties entirely different from those of sample 1. Variation in the dryness of the specimen, in the manner of loading and in the material in contact with the specimen during loading (air or water) resulted in no significant difference in the modulus of rupture.

Specimens from the second sample did exhibit plastic flow, but this flow did not reduce the modulus of rupture. This is illustrated in figure 4, the test data for a beam designated as No. 6 and freely supported at the ends with concentrated load at midspan. Loads producing maximum fiber stress shown by the figures between arrow heads were applied for periods of time indicated. Thus the stress was 94 lbs. per sq. in. for 6 days and was then raised at once to 152 lbs. Corresponding maximum deflection is not instantaneous as with elastic materials stressed below the elastic limit but is reached slowly, indicating that plastic flow is a factor in the case. The curve of figure 4 ends at a stress 646 lbs., the maximum that could be applied in the apparatus available for this test. The specimen was then removed to a standard testing machine for load to destruction. That the long-continued loading and plastic flow should have no effect on the modulus of rupture was surprising to those who conducted the tests.

Whether the two rock samples were inherently different, or whether long exposure of the first caused deterioration is a point of little importance in the present discussion. Remember always that the effect of the coaly inclusions in the rock mass in the mine governs the strength (or is the cause of weakness) of the entire mass and that this effect could not be investigated in the case of sample 2 because no specimens with inclusions could be tested without damaging them in the process.

Conclusions

From the foregoing it is concluded that failure of the coating to remain on the roof surfaces in this mine and to prevent deterioration thereof results primarily from the nature of the rock itself. The carbonaceous and coaly inclusions destroy the strength which the rock mass has otherwise. As these inclusions vary in importance from point to point, no uniformity of behavior can be expected over any great distance horizontally or vertically. There is considerable doubt as to whether roof of this kind can be benefited sufficiently by coating to justify the expense. The particular rock under study is not affected by moisture to as great a degree as others that have been studied. Were it of uniform composition throughout, unquestionably painting would greatly enhance its stability, although there is question if any treatment would be

needed for a rock as strong as sample 2 unless considerable deterioration accompanies long-time exposure.

One lesson to be learned from this investigation is that coating should not be proposed as a cure for roof troubles before the cause of the trouble is ascertained. Sealing the roof can aid only those cases in which the principal cause of trouble is exposure to air and moisture. The present case is on the borderline between partial success and outright failure; and, as noted above, it is believed that the principal cause of failure is the heterogeneous nature of the roof with resultant mechanical weakness. Of course this does not prevent oxidation or expansion caused by moisture being contributing factors, but it is believed that they are of secondary importance.

Note: The effect of the structural geology on the roof action will be covered in a subsequent committee report.

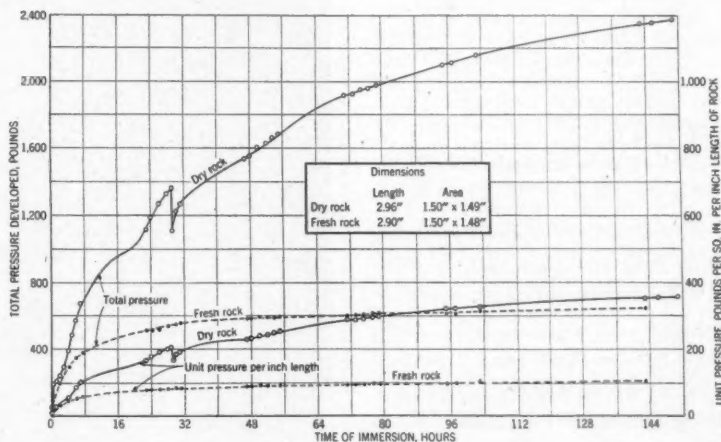


Fig. 3. Pressure developed by restraint of swelling

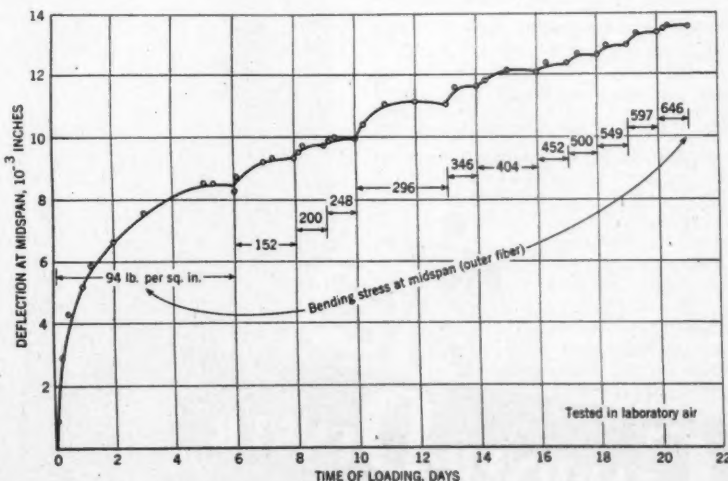


Fig. 4. Deflection of shale beam during prolonged loading



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Wheels of Government

As Viewed by A. W. Dickinson of the American Mining Congress

IN the midst of statements that the European phase of the war may run on into 1945, all in the Capitol were electrified by Senator Alben W. Barkley's revolt at the White House veto message on the Revenue Bill which branded the measure as carrying "relief not for the needy but for the greedy" and criticized the work of months on the part of the Ways and Means and Finance Committees as wholly ineffective and bestowing special privileges. Breaking with the Administration by resigning as its upper house majority leader, Senator Barkley solemnly charged that the use of the catch phrase in the veto message was a calculated and deliberate assault upon the legislative integrity of every member of Congress. The majority caucus almost immediately re-elected Barkley and he thus now becomes leader in fact without commitment to any source.

Additional headliner of the month was the publication of the Bernard Baruch report on "War and Post-War Adjustment Policies" and the Executive Order, which drew some fire from the Congress, formalizing administration of the Baruch plan. This was quickly followed by the appointment of William L. Clayton as Surplus War Property Administrator; Brig. General Frank T. Hines as Retraining and Re-Employment Director, and John Hancock as Chairman of the War Contract Termination Board.

Battle Over Revenue Bill

As the tax bill lay on the President's desk in mid-February, House and Senate leaders in a White House interview urged the Chief Executive not to exercise his veto power. Speaker Sam Rayburn and the House majority leader John McCormack joined with Senator Barkley in telling the President that changes, desired by the Administration, which had been placed in the War Contract Renegotiation section would recapture an additional \$3 billion. This, Barkley said, when

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Washington Highlights

SENATOR BARKLEY: Rebels at "greedy-needy" catch phrase.

REVENUE BILL: Becomes law as House and Senate override veto.

JOHNSON "GROSS INCOME" AMENDMENT: Now a part of the tax law.

TAX SIMPLIFICATION: House expected to pass bill by April 15.

RESTRICT TAXES: States hopeful Constitutional Convention will limit taxing power.

STOCKPILING: Batt alleges U. S. "have-not" nation.

TUNGSTEN: Premium price dropped.

BARUCH: Reports on war and post-war adjustment policies.

MANPOWER: Draft deferments tighten up.

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added to the estimated revenue of \$2.3 billion, would total more than half of the \$10.5 billion for which the White House and the Treasury have been contending.

Nevertheless, when the veto message finally came up to the Capitol on February 22, it contained a statement that the yield of the Revenue Bill had been reduced to a net of less than \$1 billion by the freezing at 1 percent for 1944 of the Social Security payroll taxes. The message charged that the bill carried special privileges in respect to reorganization provisions; percentage depletion allowances; application of the capital gains tax to income resulting from the cutting of timber; partial exemption of natural gas producers from excess profits tax,

and extension of tax subsidies to commercial airlines on their airmail contracts.

Ways and Means and Finance Committee spokesmen were quick to reply feelingly to the sharp tone of the message; for example, Chairman Robert Doughton, in speaking of the President on the floor of the House, said, "I do not feel that he should usurp the right to say not only what we shall not do but what we shall do—that is where I part company with the President of the United States."

Following Senator Barkley's classic resistance to the veto message, came the House overriding vote of 299 to 95, followed at an interval of 24 hours by the Senate vote of 72 to 14.

The Revenue Act of 1943, now law, contains the important Johnson "Gross Income from the Property" amendment for percentage depletion as well as the authorization of an excess profits credit for coal and iron mines which were not in operation in the base period.

Congress Simplifying Taxes

Seriously concerned by the demand at home, the members of Congress and particularly members of the Ways and Means and Finance Committees are grimly proceeding with their work of simplifying the mechanics of tax collections, with the definite intent of enacting a law before real action starts on the political campaign. Mr. Doughton has stated with gratification that the Congressional and Treasury staffs are working constructively with the Ways and Means Committee. Chief objectives are elimination of the need for filing tax returns by some 30 million income taxpayers through making the withholding tax on wages and salaries the final tax, and the combining of the Victory tax, normal tax and surtax, with a single set of exemptions, deductions and rates. Prime necessity in this endeavor is the maintaining of approximately the same total amount of revenue and the

same distribution of the income tax burden as we now have under existing law.

House passage of the tax simplification bill is expected by April 15, with Senate passage in June before the first political convention in Chicago.

The office of Commissioner of Internal Revenue, made vacant by the resignation of Robert E. Hannegan, who is now chairman of the National Democratic Committee, has been filled by the appointment of Joseph D. Nunan, of New York.

States Act to Restrict Taxes

Restriction of the total "take" through income and inheritance taxes in peacetime to a maximum of 25 percent is now being sought through the means of a Constitutional Convention. Fourteen states (out of a total of 32 required) have now ratified resolutions for the calling of such a convention, and in addition the upper houses of the legislatures in Virginia and New Jersey have recently given their approval. This matter is extremely important to the expansion of business enterprises, including mining, and as a means of encouraging the investment of venture capital, now stifled by the dubious outlook for a reasonable rate of return in practically all types of enterprise.

Metal and Mineral Importations

Twice in recent weeks WPB Vice Chairman William L. Batt, who is also a member of the Allied Combined War Materials Board, has in public statements advocated the importation of large quantities of raw materials, with surpluses over and above our normal import needs to be placed in stockpiles and held against any future national emergency. Batt has indicated that a control board might be created through which the importers would be assured of a market, selling to industry up to the maximum of industry's consuming requirements and the balance to the national stockpile. In these public statements, Batt has painted the United States as becoming a "have-not" nation and suggested keeping our mineral reserves in the ground. No reference has been made to the pressing problem of "freezing" surplus minerals and metals at the close of the war, nor of guarding the continued prosperity of our domestic mining regions which is so important to the over-all economy of the United States.

Senator James G. Scrugham, of Nevada, has taken issue with statements that the United States is rapidly becoming a "have-not" nation, citing the position of Interior Secretary Ickes last year when he said "I see no cause for alarm in any projected rates of depletion of mineral resources provided the necessary steps are taken to insure that as a given

mineral resource is depleted, other mineral resources are developed which would take its place."

Commerce Secretary Jesse Jones, in testifying before the House Banking and Currency Committee in mid-February, gave approval to the continuation of stockpiles after the war, to prevent demoralization of markets and to provide emergency reserves in peace and wartime needs. Jones stated that stockpiling of materials of which deterioration and storage costs are not too great is preferable to sacrifice and disruption of markets.

Senator Scrugham is still pressing for the enactment of his stockpiling bill, S. 1582, now under active consideration before the Senate Committee on Mines and Mining. Two further amendments have been drafted for consideration with the bill—one providing that the Stockpile Control Board shall consist of five qualified members of the primary and secondary minerals and metals industry, the other making definite provision for the freezing of surplus quantities of non-ferrous scrap and secondary minerals.

Tungsten Premium Dropped

With the WPB announcement of the discontinuance April 30 of premium price payments to tungsten producers, the axe has fallen on the \$6 a unit increase (above the \$24 price) granted in contracts between producers and the Metals Reserve Company. Tungsten stocks are now known to be in excess of a year's estimated needs and the Foreign Economic Administration will probably reduce the general foreign price level of \$22.60 per unit, f.o.b. foreign ports, to a figure of possibly \$16. As matters stand, MRC will buy domestic tungsten at \$30 per unit until April 30 and at \$24 per unit until June 30. Each "eligible" producer, furnishing 13,500 units or less in the preceding year, has a choice of three plans of contract termination: (1) termination of MRC purchase provision of his contract as of March 31 with termination payments for the remaining nine months of 1944; (2) continued sale to MRC at \$30 per unit with termination as of April 30 and termination payments for the remaining eight months of 1944; or (3) further continued sale to MRC from April 30 to June 30 at \$24 per unit with termination as of June 30 and termination payments for the remaining six months of 1944. The contract provides for a termination payment of \$3 per unit for the part of the calendar year remaining after cancellation, based on rate of production for the six months preceding date of cancellation.

Baruch Report on Demobilization

Released on February 18, the Bernard Baruch 120-page report on "War

and Post-War Adjustment Policies," supplemented by an Executive Order, carries a reconversion plan to become effective upon the defeat of Germany. Specific recommendations are made on the re-employment of war veterans and civilians, termination of contracts, and the disposal of surplus commodities. The report sounds a note of caution regarding the uncertainties surrounding taxes following the war and the negative effect on projection of new enterprise.

Immediately following publication of the Baruch report a joint bill, S. 1730, was introduced by Senators George of Georgia and Murray of Montana, which would create an Office of Demobilization with a board of seven full-time members to advise and assist the Director. The general policies and work of the Director of Demobilization and his deputies would be under scrutiny by a joint congressional committee authorized to sit with the Demobilization Board, and the Director would be accountable to Congress as well as to the President.

Senator George has declared that the objectives of the Baruch report can all be accomplished under the George-Murray bill and that in his belief Congress will be willing to enact any additional legislation necessary to the successful carrying-out of the demobilization policies.

Mr. Baruch promptly responded in a special supplement to his report by stating that he favors enactment of legislation by Congress to carry out his recommendations. The supplement requests a program of legislation and operation to cover completely the human side of demobilization; to aid in the termination and settlement of contracts; to aid in the distribution of surplus property; to extend the price control law after June 30; to extend the priorities and allocation powers of the President and WPB; to extend lending authority of the Smaller War Plants Corporation for reconversion; to expand authority for the Federal Reserve to make industrial loans; to enact a post-war tax law to be placed on the shelf until needed; and to authorize appropriation of funds for post-war public works projects.

Manpower Problem

Recent weeks have witnessed a tightening up in the manpower situation, in the taking of 110,000 of the soldiers in colleges under the Army Specialized Training Program for service with troops. This action was followed by dispatch of a memorandum from the President to WMC Chairman McNutt and Selective Service Director Hershey, calling for immediate review of deferments of all men of military age with particular attention to registrants under 26 years deferred because of industrial or farm work.

State Selective Service directors and local boards immediately began reclassifications, which are again drawing upon personnel in the mining field. The White House memorandum emphasized that approximately 5,000,000 men have been deferred for occupational reasons, including 930,000 single men under 26; 550,000 in agriculture; and 380,000 in war jobs.

A statement issued by the War Manpower Commission indicates that the number of men in the coal mines is no more than sufficient to provide the 620,000,000 tons of bituminous coal and the 66,700,000 tons of anthracite required in 1944. Employment in bituminous mines is indicated as having declined from 437,000 men in January, 1943, to approximately 392,000 in January, 1944, and anthracite employment has dropped from 82,000 to 73,000 over the same months.

WMC stated that while worker losses in the coal industry appeared to have been reduced considerably below the 5,000 monthly figure which prevailed recently, it is obvious that they must be checked entirely or offset by replacements if this year's tonnage requirements are to be met; and that there are certain decreases which will come through the requirements of the armed forces and the inroads of old age, disability and death. It is stated that the average age of men in the industry is now over 40 years; that 2 years ago it was around 32 years; and that loss through superannuation in 1944 will be in the neighborhood of 5 percent—from 20 to 25 thousand men.

After communicating with Selective Service, WMC has stated that "grave consideration for occupational classification will be extended to Selective Service registrants engaged in coal mining in all areas in which the labor market conditions warrant such action. Requests for occupational classification will continue to be reviewed on an individual basis, since blanket deferment of occupational groups is prohibited by law."

Further plans of WMC call for intensive recruitment drives for miners and prospective miners by the USES; efforts to improve the utilization of the manpower in mines; establishment of miner training schools; and the provision of housing facilities when found necessary.

The re-employment of returned war veterans at their old jobs is being handled by the Veterans Personnel Division of Selective Service through the State Directors, the local draft boards and their Re-employment Committees. When a new job is sought for the returning veteran, the Veterans Division of USES will function through a State Veterans Employment Representative in each state administrative office, and local Veterans

Employment Representatives in each of the 15,000 local offices of the USES.

Foremen in Unions

In the spring of 1943, Representative Howard W. Smith, of Virginia, introduced a bill, upon which hearings were held, under which supervisory officials were declared ineligible to membership in any collective bargaining labor organization. This action was the result of a campaign to organize supervisory employees in coal mines in western Pennsylvania out of which came the Union Collieries case and the National Labor Relations Board decision in favor of the unions. In May, 1943, however, came the NLRB decision in the case of Maryland Drydock Company, in which the Board laid down the general policy that foremen and similar supervisors, as representatives of management, are not to be considered as employees for the purpose of forming collective bargaining unions; after this the Smith bill was not pressed.

On February 15 the NLRB conducted a hearing which involved a specific issue as to whether discharge of supervisory officials by reason of activities connected with a foremen's union is a violation of the Wagner Act; and in the course of this hearing the entire question of the status of foremen and sub-foremen with reference to membership in unions was reviewed. A number of industrial organizations emphasized the management function performed by foremen and related supervisory officials, supporting the position that under the National Labor Relations Act they should be treated as representatives of employers, and not as workers.

In appearing before the NLRB, Secretary Julian D. Conover, of the American Mining Congress, stated that within the mining industry foremen and other supervisory officials (assistant or section foremen, shift bosses, etc.), in practice and by long-established custom, do act in the interests of the employer and perform functions of management. He stated that

they must, under the clear language of the statute, be considered as included within the term "employer," and being classed as employers it is obvious that they cannot be considered as "employees" for the purposes of the act. After explaining the duties and functions of foremen, Mr. Conover quoted the decision of the Board in the Maryland Drydock case, and stated "we submit that this constitutes sound doctrine. It should be maintained and extended to whatever extent necessary to make it clear that supervisory officials are a part of management and are not employees for the purposes of the National Labor Relations Act."

WPB Mining Division

Early in February, WPB Vice Chairman for Metals and Minerals Arthur H. Bunker, announced the appointment of Howard I. Young, president of the American Zinc Lead and Smelting Company, and also president of the American Mining Congress and the American Zinc Institute, as Deputy Vice Chairman. As head of the Minerals Bureau and Minerals Resources Coordinating Division of WPB for more than a year, Mr. Young's service has been of inestimable value to the war effort, to the industry and to the nation.

On March 3, WPB Order P-56, now covering mines and smelters, was amended to substitute the use of Form WPB-1319 as the new equipment application; this replaces Form 2910. This new form materially reduces detail work in applying for new machinery and equipment, eliminating the necessity for filing many of the special forms previously required in addition to the application to the Mining Division.

Form 2910 is now used only for applications by domestic non-serialized mines for ratings for maintenance, repair and operating supplies higher than the AA-5 assigned by Order P-56; and for applications by foreign, non-serialized mines not located in a mine supply control district for maintenance, repair and operating supplies, exclusive of "minor capital additions."

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One thought that many concerns have

found helpful in stepping up the intake from their Payroll Savings Plans is this. In many cases the Treasury Representative in a plant has been able to point out the fact that during *Loan Drive periods* the employees have found it possible to spare much more than they had counted on when setting up their original subscription, and that—when properly approached—a very substantial fraction of such employees will decide they can well afford a distinct increase in their current Payroll Savings Plan.

Talk this over with your Treasury Representative—it offers important possibilities when correctly handled. And again accept the Treasury Department's congratulations for your fine work in helping to put over the 4th War Loan.

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PERSONALS

G. M. Humphrey, president of The M. A. Hanna Co., Cleveland, Ohio, announces that the Lake Coal, Iron Ore, Dock and Vessel Departments have been consolidated into one division under the direction of J. H. Thompson, vice president.



H. L. Pierce

In the Iron Ore Department, H. L. Pierce has been promoted to the position of executive vice president of the various iron ore mining subsidiaries, in charge of mine operations and sales.

G. H. Warner continues to head the Dock and Vessel Departments, and E. J. Myers the Lake Coal Department.

George L. Craig has been appointed director of research of Calumet & Hecla Consolidated Copper Co., with headquarters in Calumet, Mich. Mr. Craig joined the Calumet & Hecla organization in 1934. Prior to that time he had been associated with the Battelle Memorial Institute.

Harry M. Moses, president of the H. C. Frick Coke Co., a subsidiary of the United States Steel, has been reappointed a trustee of the Pennsylvania State College by Governor Martin of Pennsylvania. Also reappointed trustee was Edgar C. Weichel of the Hudson Coal Co.

Walter M. Webb, Ironwood, Mich., superintendent for Republic Steel Corporation, has retired after 34 years of service with his company. F. H. Cash of Duluth, district manager of Republic Steel, announces A. J. Christenson as superintendent of the Penokee and Tobin Mines, William M. Somppi assistant superintendent, Penokee mines, and E. H. Anderson assistant superintendent of Tobin mine. These changes were effective February 1.

Robert Marsh, Jr., of Tucson, Ariz., has received an award of merit from the first Pan American Congress of Mining and Geologic Engineering, held in Santiago, Chile, in 1942. This was conferred for his work in mechanizing the methods of extraction applied to Chilean nitrate deposits, resulting in reduced costs and improved working conditions, in addition to his work in the exploitation of the copper deposits of El Teniente, Chuquicamata.

Walter M. Dake, until recently managing editor of *Coal Age and Engineering & Mining Journal* has recently taken up his duties as president of Mining Machine Parts, Inc., Cleveland, Ohio.

W. H. Forbes has been engaged by the National Safety Council as industrial safety engineer to devote full time to the work of its mining section and the recently created coal mining section. Until recently Mr. Forbes was in charge of the Denver Health and Safety Office of the United States Bureau of Mines.

C. R. Griffith recently succeeded E. C. Mahan as president of Southern Coal & Coke Co., Mr. Mahan becoming Chairman of the Board. Mr. Griffith



was with Sears, Roebuck & Co. for 15 years as manager of various retail stores, and for 12 years was manager of the retail store in Knoxville, Tenn. He joined Southern Coal & Coke Co. early in 1942, as vice president.

The Mining Association of the Southwest has elected the following officers for the current year: Howard Kegley, president; H. W. Howe, first vice president; Dr. John Herman, sec-

ond vice president; and Victor Hayek, secretary.

On February 2 at the annual dinner of The Moles, a New York organization of tunnel and heavy construction men, Arthur A. Johnson, president of Arthur A. Johnson Corp., General Contractor, Long Island, N. Y., and General Brehon B. Somervell were honored with the 1944 Achievement Award of The Moles.

Mr. Johnson is also president of The Johnson-March Corp., New York, well known in the construction and mining industries as manufacturers of concrete-curing and dust-laying compounds and other film-forming products.

H. W. Chadbourne has become chairman of the board of International Mining Corporation and Donald D. Douglas has been elected president.

L. S. Breckon has been appointed field engineer for Kennecott Copper Corporation. He will continue to supervise the geological work of Utah Copper where he has been mine geologist for 10 years.

George A. Warner has been placed in charge of fluorspar operation of Zuni Milling Co., near Grants, N. Mex. This property was recently acquired by Shattuck Denn.

George A. Sloan of New York City has been elected a member of the Finance Committee of United States Steel Corp., to fill the vacancy caused by the recent death of William J. Filbert. Mr. Sloan has been a member of the board of directors of the corporation since January, 1937.

Charles Will Wright is now chief foreign minerals specialist for the U. S. Bureau of Mines. He was formerly chief technical consultant with the Metals and Minerals Branch of the Foreign Economic Administration and is still giving general supervision to the work he started with the Metals and Minerals Branch of FEA.

Walter Maxon, formerly manager of the Crushing, Cement and Mining Department, of Allis-Chalmers Mfg. Co., Milwaukee, has been appointed to manage the new Basic Industries Department, which will correlate the activities of departments which had formerly been independent units.

In reorganizing, Allis-Chalmers also announces the establishment of a separate Texrope department, of which T. C. Knudsen has been named manager and chief engineer.

William D. Turnbull, who has been vice president and sales manager of the Pomona Pump Co., of California, has been appointed manager of the



Westinghouse Electric and Mfg. Co.'s Agency and Specialties department. Mr. Turnbull's appointment marks his return to Westinghouse after an absence of four years.

Karl L. Konnerth, chief engineer of the H. C. Frick Coke Co., since 1941, was appointed as assistant to the president in charge of engineering of the H. C. Frick, U. S. Coal and Coke, and associated companies, according to an announcement made recently by Harry M. Moses, president of the companies.

The appointments of George M. Thursby as director of industrial relations and A. J. Breitenstein as chief engineer of the Frick company also were announced.

Oliver Iron Mining Co. announced promotion of Walfred Been to assistant superintendent, Hartley-Fraser mines at Chisholm, Minn., and Lloyd S. Campbell, assistant superintendent, Fayal mine, Eveleth, Minn., effective February 1.

E. G. Schoffel, until recently in charge of the Mead reduction plant of the Aluminum Company, near Spokane, Wash., has become manager of all reduction plants for Alcoa, with headquarters at Pittsburgh. W. M. Farquhar, formerly manager of Alcoa's reduction plant at Modesto, Calif., is named Schoeffel's successor.

Paul M. Snyder has been appointed sales manager of the Climax Molybdenum Co., with headquarters in Canton, Ohio. Mr. Snyder joined the Climax Molybdenum Co., as a metallurgical engineer in March, 1932. He has been in charge of the company's sales and development work in the Canton area since that time.

The West Virginia Coal Mining Institute has recently elected the following officers: Cecil E. Jenkins, Jamison Coal & Coke Co., president; T. B. Horner, West Virginia District Mine Inspector, secretary; D. J. McGraw, District Mine Inspector, treasurer.

George F. Campbell, vice president and general manager of Old Ben Coal Corp., and president of Illinois Coal Operators Association, has been appointed to membership on the Resources Committee of the Illinois Post-War Planning Commission.

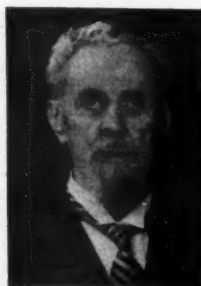
John C. Mitchell, for many years captain of the Hull underground mine at Eveleth, Minn., was presented recently with a gold medal representing 50 years of continuous service with the Oliver Iron Mining Co. W. F. Pelenz, general superintendent, of the Virginia-Eveleth district made the presentation.

The Kanawha Coal Operators' Association has loaned their acting secretary, H. G. Kennedy to the Solid Fuels Administrator, Dr. C. J. Potter, for an indefinite period on the basis of three days a week in Washington and three days in his home office at Charleston, W. Va.

Dr. Edward L. Clarke, formerly acting manager of the Joplin district office of the War Production Board, has recently accepted the position of Assistant State Geologist for the Missouri State Geological Survey of which H. A. (Chief) Buehler is head.

— Obituaries —

R. J. Walter, senior member of R. J. Walter-A. S. Walter, Mining and Metallurgical Engineers, died in Denver, February 23. Mr. Walter was born in St. Louis, Mo., July 6, 1860, attended Colorado School of Mines, Denver University and University of Ber-



lin. As a mining engineer and metallurgist of the West, he was prominent in all mining rushes from 1878 to Goldfield, Nevada, days. He did his first consulting work in Cripple Creek at Bennett & Myers lease. Mr. Walter was one of the founders of the famous "Sowbelly" annual dinner of the Colorado Mining Association.

Elkin W. Beard, Belting Engineer of the United States Rubber Co., died on Wednesday, January 5 at the Grant Hospital, Columbus, Ohio, following a short illness. Mr. Beard was widely known in the coal industry, having represented the United States Rubber Co. in that field for many years. He also served on the Conveyor Committee of the Coal Division of the American Mining Congress. Burial was held on January 7 at his boyhood home in Lexington, Ky.

Allan E. Hall, since 1920 manager of the milling machinery department of Allis-Chalmers Mfg. Co., Milwaukee, Wis., died January 17 after an illness of several months. He was 70 years old.

George W. Hezzlewood, formerly mining engineer at the Tintic Standard Mining Co., and later at Cortez, Nev., before going to the Philippines as Assistant Superintendent of the Balatoc Mining Co., Baguio, died on Corregidor in May, 1942, according to a letter from his widow to his daughter, Miss Betty Hezzlewood. Mr. Hezzlewood was well known for his tunnel driving ability, having developed the Hezzlewood switch and other items to speed up tunnel driving. He was a graduate of the Minnesota School of Mines.

Clyde McK. Laizure, mining engineer, associated with the San Francisco office of the California State Division of Mines for 26 years, died of pneumonia at his Alameda home on December 21. Mr. Laizure was 65 years of age.

Jesse Jay Ricks, Chairman of the Board of Union Carbide and Carbon Corp., died at his home in Plandome, N. Y., on February 20, 1944, after a brief illness. He was 64 years of age.

Mr. Ricks became Chairman of the Board of Union Carbide and Carbon Corp. in 1941.

Arizona lost two of her pioneer mining men in the death on January 11, of Alexander Kidd, 74, in Bisbee, and of Homer Campbell, 71, in Phoenix, on January 7. Kidd had been an employe or associate of Phelps Dodge Corporation executives for 41 years, in Bisbee and Courtland. Campbell came to Arizona in 1876, and engaged in mining at Wickenburg until retirement 10 years ago.

Harry T. Hamilton, 63, assistant to the president of the New York Trust Co., and former manager of the Montezuma Copper Co., at Nacozari, Sonora, Mex., died on February 5, at Summit, N. J.

News and Views

Eastern



States

WEST VIRGINIA

» » » Absenteeism continues as the major drawback to production in the Kanawha District. Since the last week in August, 1943, the percent of productive labor absent has ranged in the district from 15.1 percent to 32. The non-productive labor range for the same period is 9.1 percent to 22.7, while the high and low points for all labor range from 12.4 to 27.8.

» » » Mine inspectors, executives and safety men who are members of the Mine Inspectors Institute of America will meet in Charleston on June 5 and 6 for their annual group conference.

» » » West Virginia's mine training program, inaugurated by the War Manpower Commission to offset an acute mine labor shortage, may become a model for other coal production states.

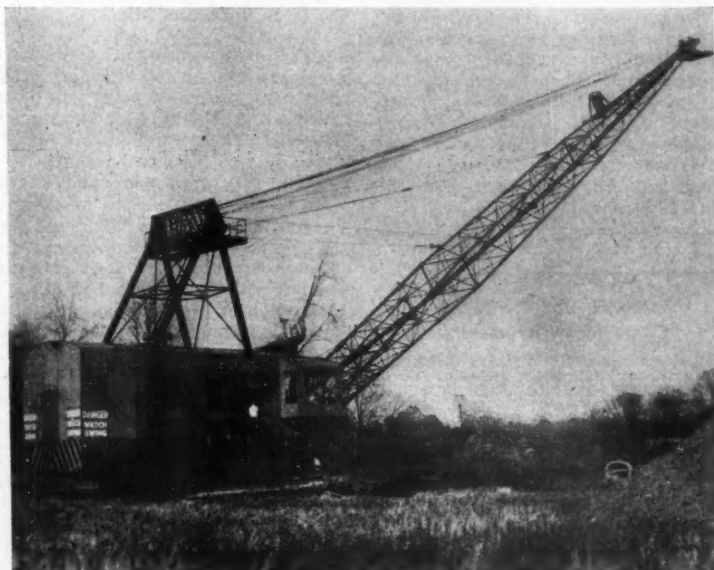
Training officials from Virginia, Kentucky and Ohio conferred recently with State Manpower Director Andrew Edmiston and agreed that training in mine maintenance during the present war emergency should be geared "for the speedy turnout of workers." Glenn S. Callahan, WMC training chief, of Washington, led the discussions.

The representatives were told that West Virginia now offers mine training courses in Logan which include instruction in general maintenance, timbering, blacksmithing and other essential mine operations. Government instructors handle the courses

and the equipment is furnished by local mine management.

» » » The appointment of an eight-member state management-labor committee to act in an advisory

capacity to the War Manpower Commission of West Virginia was announced by State Manpower Director Andrew Edmiston. The committee will have as one of its principal duties the hearing of appeals from the 26 local offices of the U. S. Employment Service in West Virginia. These appeals, made both by management and labor, are principally concerned with the issuance of or denials of statements of availability, permitting the transfer of workers from one essential plant or industry to another.



Coal stripping operations in the vicinity of Grove City, Pa., are being accomplished by a walking type dragline. The 350-ton machine powered by a Cooper-Bessemer 6-cylinder Diesel engine, has a 160-ft. boom, 27-ft. pontoons and 7-ft. stride. It is required to travel over rough, wooded terrain, cross streams and climb fairly steep slopes. The main Diesel unit also generates additional energy for two vertical electric motors totaling 80 hp. for operating boom and dragline bucket, as well as to supply current for the lighting system

PENNSYLVANIA

» » » Bethlehem Steel Corporation disclosed recently that purchase of 70 coke ovens at its Steelton plant is the first of many similar transactions to be made for additions and improvements on its property.

Frank A. Robbins, Jr., Steelton division manager, said the ovens, constructed with Federal funds, doubled coke production capacity at the plant.

The company is reported to be considering additional installations at Steelton and Government-built steel-making facilities on other company property, particularly coke ovens and blast furnaces at Lackawanna, N. Y., Bethlehem and Sparrow's Point, Md.

» » » The old Star and Cincinnati coal mines in Union Township, Washington County, will be reopened by the Pittsburgh Coal Co. to help meet demands for fuel. Eventually they will provide access to large untapped coal reserves in an adjacent area. The Star mine has been closed about seven years and the Cincinnati shaft has been down 15 years. To be combined into a single operation known as the Mingo mine, they are expected to yield 1,000 tons a day by the end of this year. Clearing away of debris and shale at the entrance of the Star mine, near Courtney, has already commenced.

» » » At a meeting of operators in Ebensburg, early in February, the Monroe Coal Mining Company at Revloc was awarded the safety banner for compiling the best safety mark during the past year for companies enrolled in the Ebensburg Council of the Joseph A. Holmes Safety Association. William Lamont, general manager of the Sterling Coal Company, Bakerton, spoke on inspections of coal mines. "The Effect of Meth-

ane on Explosibility of Coal Dust" was discussed by George Groves, of the U. S. Bureau of Mines.

» » » It is reported that canteens to provide miners with more meat, cheese and processed foods will be established in Nanty Glo, Revloc and Heilwood. The inauguration of the new plan was discussed recently at a meeting of Government and United Mine Workers of America officials.

Government officials announced that the program calls for providing food at the entrances to mines for the workers without rationing points.

Adoption of the program will mean the employees of the Monroe Coal Mining Company at Revloc, the Heisley Coal Company at Nanty Glo, and the Redlands Coal Company at Heilwood, will obtain more meat and cheese.

» » » H. Raymond Mason, acting state War Manpower Commission director, has disclosed a Federal 3-point program to help alleviate the critical shortages of anthracite and bituminous coal:

1. U. S. Employment Offices given "definite instructions" to release any experienced anthracite or bituminous coal miner from any other job, regardless of its essentiality, to permit him to return to the mines.

2. WMC's various training branches

will school present mine personnel and new workers in methods of obtaining maximum production.

3. Efforts were stepped up to recruit more new workers for mining jobs.

» » » A record tonnage was produced at the Nemacolin mine of the Buckeye Coal Company recently when the regular day shift of the 57th Road Section, "C," produced 858 tons of coal. This is the largest amount ever attained by a single shift of a loading machine unit at the Nemacolin mine.

General Superintendent E. B. Agee and Superintendent J. N. Hedding in making the announcement, congratulated the men of the mine crew, as well as the members of the three other crews of this section, for "this outstanding record and splendid display of teamwork and cooperation."

» » » The Pennsylvania Edison Company has entered into leases covering approximately 1,000 acres of coal land south and east of Dudley, Huntingdon County, Pa. The area involved includes the workings of the Martha Slope mine, which has not been operated since 1924, and the Midlothian mine, both located adjacent to Dudley.

The power company's subsidiary, the Blair Engineering and Supply



John Curtis, veteran hose builder, coming out after making an inspection of the inside of a large section of flexible hose built by The B. F. Goodrich Company at Akron, Ohio. Made of 14 plies of heavy duck fabric coated with synthetic rubber and reinforced with two coils of heavy wire, this hose weighs 2,200 pounds and is 15 ft. long. It will be used in hydraulic mining of phosphate from which phosphorous, fertilizer and various types of medicine are manufactured

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Mine Management

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Company, has acquired the surface surrounding the Midlothian mine opening through which the coal under lease will be removed and brought to the surface. The entire output will be used for the Pennsylvania Edison Company's generating plant at Saxton. It is expected, when normal production is reached, approximately 1,000 tons of coal will be mined each day.

» » » Thousands of anthracite miners worked in the mines on Sunday during February in an effort to alleviate a critical coal shortage.

KENTUCKY

» » » More than 1,400 coal miners' children in Pennsylvania, West Virginia, and Kentucky have healthier young bodies today than they had a year ago as the result of the sixth annual pre-school clinics conducted by the Koppers Coal Nursing Service in 1943, Miss Edythe Frethy, R.N., supervisor, announced recently.

Last year 1,613 children between the ages of six months and six years were brought to pre-school clinics held in 12 Koppers mining communities for thorough examinations by a pediatrician; an eye, ear, nose and throat specialist; a dentist and a general practitioner.

Physical defects discovered by these authorities totaled 1,837 while 77 percent of them, or 1,414, had been corrected by the end of 1943.

"The greatest enemy of good health discovered was poor baby teeth," Miss Frethy said. "Many children were found to have badly neglected baby teeth that would have resulted in poorly-formed jaws and inferior permanent teeth had they not been discovered and taken care of in time."

Defects discovered at the clinics, in order of their prominence, and the percentage corrected were dental, 64 percent; tonsils and adenoids, 70 percent; phimosis, 64 percent; underweight, 100 percent; overweight, 100 percent; ears, 100 percent; hernia, 78 percent; skin disorders, 98 percent; lungs, 100 percent; heart, 92 percent; eyes, 71 percent; nose, 100 percent; feet, 63 percent; and other minor defects, 79 percent.

Communities in which pre-school clinics were held in 1943 and the number of children examined at each were: Weeksbury, 107; Carswell, 189; Keystone, 90; Wharton, 130; Kopperston, 146; Powellton, 168; Glen White, 126; Helen, 114; Stanaford, 167; Everettville, 188; Grant Town, 132; and Sonman, 56.

Plans are now being made for the 1944 clinics which will be held late this spring.

NORTH CAROLINA

» » » Drilling to determine the feasibility of reopening on a large scale the Deep River coal belt of North Carolina will be started by the U. S. Bureau of Mines within the month, Governor J. Melville Broughton announced. The work will be done under the \$2,000,000 appropriation recently made by Congress to explore new sources of certain minerals.

The extensive coal fields have been worked intermittently and unsuccessfully since the Revolution, and closed finally in 1930 after an explosion (one of a long series) discouraged operators. However H. A. Brassert & Co., after a state-sponsored survey, reported that no unusual difficulties to recovering the coal existed and that modern mining precautions would remove the danger of explosions which have plagued the operation for so many years.

Already the old shafts of the Coal Products Co., of Sanford, N. C., are producing around 25 to 30 tons of coal daily, which is being bought by consumers at the mine door and used as domestic fuel. The drillings and others being made are part of a large-scale exploration of North Carolina's mineral resources, with both state and federal funds.

Previous drillings have proven the presence of 8,500,000 tons of coal in the Deep River fields, and Brassert estimates a probable reserve of 46,000,000 tons. Occurring between two seams of coal is a black band composed largely of limestone and iron carbonate which formerly was mined and sold with the coal, resulting in an inferior fuel. The engineer says there is no reason why the seams cannot be mined separately, the black band possibly utilized as fertilizer, with the iron component recovered for sponge iron manufacture or in mixture with other ores. Brassert says the coal itself is desirable as a fuel for domestic, gas, metallurgical and other industrial uses.

When tested by the U. S. Bureau of Mines, the coal proved to have good coking properties and to give a relatively high yield of by-products, with a B.T.U. of 14,220. The tar yield was found to be 22 gallons per ton and the ammonia sulphate yield 30 pounds per ton, which content compares favorably, says Brassert, with the Freeport, Pa., coal.

With \$270,000 of the federal appropriation allotted to North Carolina, drillings already have been made for tungsten and molybdenum, and a large deposit of tungsten was reported in Vance county. Currently,

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drillings are being made for iron ore in the western part of the state.

» » » The Geological Survey's effort to aid owners and operators to increase production of iron ore essential to the war program includes the study of incompletely explored iron ore belts and abandoned mines in all parts of the country. The investigations in the Cranberry district, results of which are given in the present report, were made in this connection. The report deals primarily with the Cranberry magnetite belt in Avery County, N. C., and Carter County, Tenn., but also giving brief consideration to other magnetite deposits in Mitchell, Madison, and Ashe Counties, N. C. The ore is described as occurring in a series of discontinuous, more or less parallel veins, the lean ore composed of granular magnetite scattered in hornblende, and the richer ore of magnetite more or less segregated into stringers, veins, and lenses.

Although a few large copper and zinc deposits in the Eastern States have been worked continuously for a long time, many smaller ones have produced only during brief periods when copper and zinc prices were high. With the wartime need for copper and zinc, it has been necessary to appraise the smaller deposits as possible sources of additional metal. The Hazel Creek mine in Swain County, N. C., is one of the more promising copper-zinc deposits studied by the U. S. Geological Survey as part of a program undertaken in the Great Smoky Mountains, about five miles from the village of Proctor in Swain County, N. C. The geologic work was done by G. H. Espenshade, M. H. Staatz, and E. A. Brown during April, May, and June of 1943.

GEORGIA

» » » A map of the Mitchell Creek mine, in Upson County, Ga., the largest mica-producing mine in the Georgia-Alabama region, has been prepared by the Geological Survey, according to a statement made public recently by Survey Director William E. Wrather. The Mitchell Creek mine was first prospected in the fall of 1942, and the current operations by S. P. Cronheim were begun in December of that year. The mica found is the variety known as muscovite and is of good quality. The average size of the blocks is relatively small, but they are flat and solid so that the proportion of sheet mica recovered from them is relatively high.

OHIO

» » » The American Rolling Mill Co., with general offices at Middletown, Ohio, has announced the creation, effective March 1, 1944, of a Mining Division. The newly formed division will hereafter have direction of operation of coal mining properties, both parent company and subsidiary.

Chas. W. Connor, formerly general superintendent of mines for ARMCO has been appointed manager of the Mining Division, and Mr. Connor has announced the appointment of C. E. Hough as general superintendent of mines for ARMCO and subsidiaries.



Chas. W. Connor



C. E. Hough

Mr. Hough, who was formerly assistant to the vice president of the New River Co., Mt. Hope, W. Va., has already assumed his new duties.

Mr. Connor will continue in his position as vice presi-

dent of the Colcord Coal Co., and vice president of Colcord Coal Sales Co., both affiliates of ARMCO.

Paul R. Maxey, formerly chief mining engineer for The American Rolling Mill Co., and Colcord Coal Company, has been appointed superintendent of the Montcoal and Stickney mines of the Colcord Coal Company, succeeding Wayne M. Davis, resigned.

» » » Abrasion index for metals in contact with moving coal and coal ash; the relation of surface and inherent moisture in coal to its grindability; the mechanism of combustion; the rate of flame propagation; the fundamentals of flow of coal and air in pipes; the effect of recirculation of flue gases on combustion; the fusion of coal ash and radiation from flames were significant subjects discussed at a meeting of the Committee on Industrial Utilization of the Technical Advisory Board of Bituminous Coal Research, Inc., with representatives of the manufacturers of pulverized coal equipment at Battelle Memorial Institute, Columbus, Ohio, recently. Some work by BCR is already under way or completed. The extension of the uses of pulverized coal into non-steam uses where oil and natural gas have largely supplanted coal, was also discussed at this meeting. In attendance were representatives of the manufacturers of pulverized coal equipment, members of the staff of the Coal Research Laboratory of the Carnegie Institute of Technology and members of the staff of Battelle Memorial Institute. The meeting was sponsored by the Industrial Utilization Committee of BCR.

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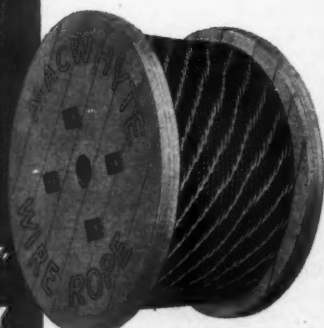
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Central



States

ILLINOIS

»»» The 26th Annual Summer Meeting and Boat Trip of the Illinois Mining Institute will be held June 9-10-11, aboard the S.S. *Golden Eagle*, leaving from St. Louis. A complete program will be announced in the near future.

MISSOURI

»»» The entrance of Park City Consolidated Mines Company into the list of the country's lead producing mines with completion of a new 500-ton milling plant at the company's property situated in the South East Lead belt at Fredericktown, about 92 miles south of St. Louis, Mo., is announced. The plant went into production late in January treating 400 tons of ore per day. The plant is rated at 500 tons per day and was built at a cost of \$155,000. A 70 percent lead concentrate is being produced and plans call for gradually increasing production to capacity.

The plant was designed and equipped by the Booth Thompson division of the Galigher Machinery Company, Salt Lake City. A 50-ton car of concentrate is being shipped every other day to the St. Joseph Lead Smelter at Herculaneum, Mo.

Following preliminary development work, ore was encountered by the company last year, which resulted in the development of some 300,000 tons of ore averaging 5 percent lead. Approximately 15,000 tons of ore was stockpiled prior to the completion of the mill.

A Joplin system of mining is being applied. Sixteen cu. ft. "cans" are loaded and hoisted to the surface by means of a Joplin type hoist. Underground loading and haulage is done by mechanized methods. Carl V. Stehle, New York, is president, and Richard C. Badger, 2380 Washington Boulevard, Ogden, Utah, is executive vice president.

MINNESOTA

»»» A change-over from a 3-stage to a single-stage belt conveyor system is taking place at the Mesabi Mountain mine at Virginia. The new belt being installed for the Charleson Iron Mining Company is of the steel cord, high tension type. It will operate on 915 ft. centers with a vertical lift of 268 ft. This new conveyor is 30 in. wide and will handle 500 tons per hour at its normal speed of 550

ft. per minute. It is driven by a 200-hp. slip ring motor.

»»» The Pontiac property 2 miles north of Crosby, Minn., on the Cuyuna iron range, is being drilled by the Cleveland-Cliffs Iron Company. The lands being explored include the Clark mine and Joan No. 3 reserve in the Crow Wing County manganiferous ore belt.

»»» The first annual Minnesota mining symposium was held recently at the University of Minnesota. The general subject treated was "Iron Ore Beneficiation." Concentrating practice in various districts in the United States were discussed by J. R. Linney, Republic Steel Corp.; A. F. Peterson, Bethlehem Steel Co.; Oscar Lee, Republic Steel Corp.; and B. D. Johnston, Oglebay, Norton & Co. Special features on concentration were explained by W. L. Maxson, Allis Chalmers Co.; B. J. Larpenteur, The Dorr Co.; Donald N. Griffin, The Deister Co.; Grover J. Holt, Cleveland Cliffs Iron Co.; R. H. Lowe, American Cyanamid Co.; and J. A. Swart, Jones & Laughlin Co. Mr. Paul McCrackin of the Minneapolis Federal Reserve Bank discussed "The Market for Iron and Steel After the War."

The symposium was organized and

conducted by Elting H. Comstock, Administrative Assistant, Minnesota Institute of Technology; Edward W. Davis, Director, Minnesota Mines Experiment Station; and J. M. Nolte, Director, Center for Continuation Study.

TEXAS

»»» A new use for sulfur and coal tar derivatives was made known in the announcement that the Du Pont Company has taken option to buy an 822-acre site containing the San Jacinto shipyard property of the U. S. Maritime Commission a mile and a half north of LaPorte, Tex.

This transaction will bring E. I. du Pont de Nemours & Co., into Texas for the first time as a manufacturer in a sizeable plant. Construction and adaption of certain present shipyard facilities is expected to begin shortly on what will be known as the Houston Works of the Grasselli Chemicals Department of Du Pont. The first production unit will be devoted to phenothiazine, a chemical synthetic for ridding livestock of internal parasites which normally cost the nation an estimated \$125,000,000 damage annually.

Dr. I. B. Boughton of the Sonora, Texas, substation of the Agricultural Experiment Station at Texas A & M College, has headed valuable research studies on the methods of using the chemical. A complex substance involving sulfur and coal tar derivatives, it has often been described as an "amazing" product since its discovery as a control of those internal parasites that cause sheep, goats, swine, cattle, horses, mules, and poultry to lose weight and sometimes die.

STRICTLY BUSINESS



—Washington Daily News

"I wonder what that woman owner will think of next!"

» » » Mines in Texas yielded (in terms of recoverable metals) 5 fine ounces of gold, 9,745 fine ounces of silver, 170,000 pounds of copper, and 22,000 pounds of lead in 1943, according to the Denver office of the Bureau of Mines, United States Department of the Interior. These preliminary figures are based on 10 months' actual mine production with November and December production calculated from reports by mine operators and smelters of anticipated shipments and receipts.

Producing metal mines in the State in 1943 were all located in Culberson and Hudspeth Counties. The Hazel mine, 14 miles northwest of Van Horn, Culberson County, operated throughout 1943 by J. P. Witherspoon, lessee, made regular shipments of dry silver ore to the copper smelter at El Paso. A small shipment of dry silver ore was made from the Needle Peak open-cut mine near Van Horn to the El Paso copper smelter. M. F. Drunzer operated several leases in Hudspeth County during 1943, among them the Sancho Panza mine and Garren lease seven miles northwest of Allamore, and the Plata Verde mine, 14 miles southwest of Van Horn. Intermittent shipments of dry silver and lead-copper ores from these and other small operations were made by Drunzer during 1943 to the El Paso copper and lead smelters. J. S. Barlow shipped a carload of dry gold ore to the El Paso lead smelter from the Bona mine, six miles southwest of Sierra Blanca, during the latter part of the year. A lessee on the Black Shaft mine, nine miles northeast of Allamore, shipped a carload of copper ore to the El Paso copper smelter.

MICHIGAN

» » » The Wakefield Iron Mine of the M. A. Hanna Company at Wakefield, Mich., has discontinued production. Adjacent virgin territory is being extensively explored with the hope of locating additional ore reserves. Forty thousand tons of ore in stockpile will be shipped this season. The Wakefield Mine has enjoyed 30 years of productive activity, during which it has shipped nearly 13,000,000 tons of iron ore.

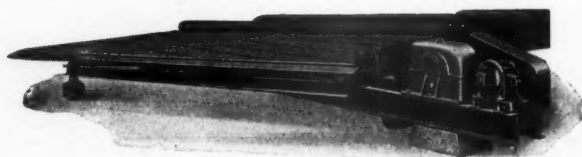
» » » The Marquette Range Engineers Club has elected the following officers for 1944: E. G. Day, president; Lawrence G. Collins, vice president; Frank Masek, treasurer; Berton Boyum, secretary; E. H. Hayden and C. J. Myron, directors.

» » » A. Kuzim, L. M. Voronin and Mr. Borisov, identified with mining and metallurgical activities of the Soviet Union, recently made a visit of inspection on the Gogebic iron range of Michigan. Their pur-

pose was to acquaint themselves with the methods of mining and of the various kinds of equipment and machinery employed in the Lake Superior District. A. Millensky of New York City and C. L. Kohlhaas of Duluth, both of the Gardner-Denver Company, accompanied the visitors. Their visit followed closely the recovery of iron ore and manganese areas in Russia from the Germans.

» » » The Zimmerman Iron Mine at Gaastra, Mich., on the Menomi-

nee iron range, formerly leased by the M. A. Hanna Company has now been leased by Pickands Mather & Company. It is reported that the purpose of the lease is to facilitate mining of the adjacent De Grasse ore body through the Zimmerman workings. The Zimmerman mine became exhausted and was permanently closed last season. Pickands Mather & Company will obtain employees for the new operation from the Bengal Iron Mine at Stambaugh, where operations have been suspended.



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Western



States

COLORADO

» » » Mines in Colorado yielded (in terms of recoverable metals) 136,128 fine ounces of gold, 2,602,624 fine ounces of silver, 1,990,000 pounds of copper, 36,388,000 pounds of lead, and 84,190,000 pounds of zinc in 1943, according to the Denver Office of the Bureau of Mines. These preliminary figures are based on 10 months' actual mine production, with November and December production calculated from reports by mine operators, refineries (including Denver Mint), and smelters of anticipated shipments and receipts.

The continued demand in 1943 for essential war metals stimulated the production of zinc to a greater output than any previous year since 1918. Although the operation of the mines of the State continued to be delayed by shortages of labor and many and varied Government regulations, the production of zinc and lead continued to increase in 1943.

» » » The Department of Publications of the Colorado School of Mines, Golden, announces the publication of "Hydrocarbons of the Uinta Basin of Utah and Colorado" as volume 39, No. 1 of the *Quarterly* of the Colorado School of Mines.

Under this title are included treatments of two phases of the subject: "Review of Geology and Field Work," by Clark F. Barb, professor of petroleum engineering, and "Survey of Bitumen Analyses and Extraction Methods," by James Ogden Ball, associate professor of petroleum engineering.

This issue of the *Quarterly* comprises 115 pages and copies may be obtained from the Department of Publications of the Colorado School of Mines, Golden, Colo., at \$1.50 post-paid.

NEW MEXICO

» » » The new fluor spar mill at Gila, Grant County, is operating three full shifts and treating a large tonnage of ore following its completion in January by the International Mineral & Chemical Company of Carlsbad. Capacity of the mill is 300 tons daily. The mill is receiving ample ore from fluor spar mines in the Grant County mining area.

» » » Maintaining its record in the Fourth War Loan, as in the previous loans, New Mexico's mining industry—corporations and workers, alike, were large purchasers of war bonds to enable the state to exceed its quota of \$16,000,000. In Grant County, principal mining area of the state, the \$1,091,660 quota was exceeded by approximately \$200,000 with corporate subscriptions accounting for more than half of the grand total.

» » » The New Mexico State Bureau of Mines, supported by a \$25,000 state appropriation, will hereafter function as a bureau separate from other departments of the New Mexico School of Mines at Socorro. This decision was reached at the February meeting of the board of regents of the School of Mines. However, the Bureau of Mines will continue to use the facilities of the school, but will have its own staff devoted to bureau work entirely. State Geologist John Kelly, Santa Fe, was elected director of the State Bureau of Mines, and Fred O. Davis, Carlsbad, was elected secretary. The latter is a member of the School of Mines board of

regents and president of the New Mexico Miners and Prospectors Association. Outlined to the bureau by Director Kelly at the first meeting was a tentative program for development of oil, metallic and non-metallic branches of the mineral industry. Under consideration also are far-reaching post-war plans.

» » » Warren C. Bracewell, Albuquerque, N. Mex., state inspector of mines, has inaugurated an intensive safety program for 1944, to further improve the record established during 1943, when total fatal accidents set a new low record, 12 for last year, 4 in mineral mines and 8 in coal mines. Mine owners, operators and workers are cooperating in the program to prevent fatalities and reduce accidents.

UTAH

» » » A development project entered into by two of Utah's larger mining companies in the East Tintic district, is now entering its most interesting stage. Known as the Development Unit, the project was started in October, 1941, under an agreement between the Tintic Standard Mining Company and the North Lily Mining Company, a subsidiary of International Smelting & Refining Company. Work in the Development Unit was to sound out the ore production possibilities of an area consisting of 143 acres of ground in the East Tintic district, which includes



Safety goggle lenses ground to prescription to correct defective eyesight can also be toughened. Above, Normand Lemoine, of the American Optical Company, operates a special heating-chilling machine which in two minutes tempers a prescription safety lens so that it resists breakage. Lucy Davis, at the right, wears a pair of safety goggles which correct vision and also provide protection against industrial eye hazards



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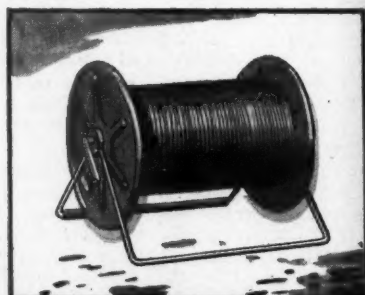
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[Page 70]

parts of the Eureka Lilly Consolidated Mining Company and the Twentieth Century Mining Company properties.

The area, hitherto undeveloped at depth, is regarded by geologists and engineers as one of the most promising areas in the Tintic district. Since 1941, more than 8,000 ft. of lateral work has been done and several promising ore showings encountered. Work in the Development Unit is being performed from the 1,450 ft. level of the No. 2 Tintic Standard shaft. A drift was extended southwesterly along what is called the South Fault, a premineral fault which has led to ore in other parts of the district. With the drift well within Twentieth Century ground a raise was extended 100 ft. to the 1,570 level. (The drift is 2,000 ft. below the surface at this point.) From the top of the raise the area was diamond drilled to locate the various strata of the Ophir formation, the "B" limestone of the Ophir series being the objective. A streak of ore was followed upward in the raise and additional diamond drilling is now contemplated to probe the "B" limestone.

» » » The Tintic Standard Mining Company is developing fluor-spar at recently acquired properties situated in the Middle Range of mountains, southeast of Milford, Utah. The company has acquired approximately 123 acres and with preliminary development work completed in the mine work is now concentrated upon the completion of a milling plant. The mill will have a capacity of 150 tons per day and is expected to be ready for operation early in April. Preliminary prospecting work at the property was done by the United States Bureau of Mines. James W. Wade, Walker Bank Building, Salt Lake City, is president of Tintic Standard.

ARIZONA

» » » Mining families of the Miami and Inspiration, Ariz., communities have reaped an 18.15 percent dividend from the Miami Mercantile Company for the last half of 1943, payments going to 2,632 customers. For the first six months of the year the company paid a 15 percent dividend amounting in total to \$76,000, it was reported.

» » » A proposal for the Metal Reserves Corporation to establish a stockpile of tungsten at Tucson has been approved by the Tucson city council. Nearest stockpile to date has been in Phoenix, 125 miles away. The development of tungsten deposits in this Catalina district makes the move desirable, according to a statement by William L. Merritt, supervising

engineer of the Reconstruction Finance Corporation in Washington. He said that the Catalina Mountain strike is an outstanding one.

» » » Discontinuance of all wage rates below \$5.88, adjustments retroactive to April 4, 1943, have been ordered in the case of three Arizona mining and smelting companies by the Nonferrous Metals Commission. Affected were the Miami Copper, International Smelting and Refining, and the Inspiration Consolidated Cop-

per companies. The adjustment clauses will become effective on determination by the Office of Price Administration that they will not require any change in price ceilings, or upon approval of the economic stabilization director, it was said.

» » » Arizona's production of 802,500,000 pounds of copper, greater than in any year to date, except for 1929, led the nation's copper output in 1943, according to report of the Federal Bureau of Mines.

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In gold production, Arizona's 173,000 fine ounces of gold was second in the nation only to Utah, the report revealed. Utah mined 381,763 fine ounces. Utah's copper production was listed as 646,100,000 pounds.

» » » Employees of all Phelps Dodge Corporation mines and plants in Arizona are on a 48-hour maximum work week. Smelter operations at Douglas, Clarkdale and Morenci are continuing on the around-the-clock schedule. Shifts are staggered to allow employees one day off each week. The change will not affect production, and the 1944 output will exceed that for the year previous, according to Harry Lavender, Arizona general manager.

NEVADA

» » » Glenn L. Allen, Nevada district engineer for the United States Bureau of Mines, has just announced that extensive core drilling of coal beds near Coaldale, in Esmeralda County, will be started at once by the Bureau. Tests made at the Government station at Seattle on three carloads from the Coaldale mines, indicate a high heat value. The Esmeralda County coal is known as the Darms property and efforts have been made for many years to get it developed. It is only in recent months that the Federal Government has become interested. At least four distinct coal beds, ranging in thickness from 4 to 30 ft. have been developed to some extent in work conducted over a long period by H. A. Darms, who has controlled the area for more than 30 years.

» » » The Nevada State Advisory Mining Board held a meeting late in January at the office of Gov. E. P. Carville, in Carson City, for a general discussion of mining problems. Special consideration was given to the future outlook for war metals, notably magnesium, mercury and tungsten, in view of recent reports that abundant supplies of these metals are now available to meet the needs of war industries.

Continued operation on a substantial scale of the Basic Magnesium plant at Las Vegas was also discussed.

» » » After three years of intermittent development work, the first carload of tungsten ore was shipped from the Valley View mine 6 miles south of Carson City the middle of January. The mining property is only a short distance southeast of the Nevada state prison.

» » » New interest has been aroused in property on the old Fifty-Six copper mine, 6 miles west of Imlay, in Pershing County, largely because of the long time high standing

DON'T BE AN ACCIDENTEE!



in mining circles of the group engaged in the enterprise. The Fifty-Six was said to be northern Nevada's oldest metal mine location, having been originally a copper property, from which some ore was shipped in early days.

The new interest is due to the discovery, by drilling, of molybdenite underneath old workings. The property, according to reports, is being prospected by Harvey S. Mudd, son of the late Seeley Mudd, of the noted Mudd-Wiseman organization, which operated the famed United Eastern mine at Oatman, Ariz.

» » » Title to the famous mines of Austin which yielded millions in silver in early days, has fallen into the hands of Lander County. The last effort to work the properties on a large scale was promoted by Paul Klopstock, New York broker, and he had to give up after spending several hundred thousand dollars on the Austin Silver Mining Company, which he formed to take over the old mines. Lander County took title recently at tax sales.

The mines of the Austin district produced some 50 millions in the early days and made several millionaires. In the effort to reopen them it has been said that advice of practical miners of the district was unheeded, and advice of engineers unfamiliar with old conditions taken. It is still maintained by a few of the old timers that rich values could again be found if their advice is followed.

» » » Northern Nevada mining men have been asked to join in a hunt for high-grade fluor spar to help out in a situation said to be somewhat desperate. The Government, it is said, will be short some 40,000 to 50,000 tons of hydrofluoric acid,

nearly the No. 1 strategic chemical, and a representative from the St. Louis ordnance district, Major R. B. Silverman, has issued the appeal to Nevada mining men to search for and aid in developing high-grade fluor spar. He said only high grade, or 99 percent, could be used.

» » » Mine properties and plant of the Pershing Quicksilver Company, operating in the Relief, or Antelope Springs district in southern Pershing County, have been purchased by H. B. Chessher and Leo F. Schmidt. The company was at one time the largest producer of quicksilver in Nevada. Operation of the property continues under the new ownership. The property was controlled by the First National Bank of Chicago, as trustee for the estate of George Hubert Jones, reputedly one of the wealthiest men in Illinois at the time of his death. Continuation of the operation of mine and plant will depend in large measure on the future market for quicksilver.

CALIFORNIA

» » » Sale of the famous Iron Chief mining claims by the Southern Pacific Land Company to Henry J. Kaiser Company for approximately \$1,000,000 was disclosed through the Riverside County Recorder Office, Riverside, Calif. on February 10.

The property involved in the transaction comprises slightly more than 2,764 acres situated in the Eagle Mountain area about 10 miles northwest of Desert Center and 35 miles east of Indio.

For many years the Iron Chief has been known as one of the largest iron ore deposits in the Southwest. Originally located in the 80's it has changed ownership a number of times and has had extensive work done on it in years past.

The ore is composed of associated metamorphic minerals occurring as replacements in dolomite. Virtually bisecting the Eagle Mountain Range, the main width of the outcrop varies from 500 ft. to 2,500 ft. The ore is predominantly hematite spotted with masses of magnetite, making the entire body slightly magnetic.

A large percent of the ore is extremely high grade containing as much as 62 percent to 67 percent metallic iron and less than 0.06 percent phosphorus. A sufficient supply of water is obtainable from Cottonwood Springs, about 18 miles north of the main workings.

Kaiser Company undoubtedly intends using the ore at the recently constructed steel mill at Fontana, Calif. Ore being used there at present is shipped from the Vulcan mine, another Kaiser Company property, near Kelso, Calif.

IDAHO

» » » "The future outlook for Sunshine," says President R. M. Hardy in the annual 1943 report of the Sunshine Mining Company, "has been much improved by the discovery of a new and important lead-silver ore zone to the north and east of the Sunshine vein system in the lower levels of the mine. As a result of this new development the Sunshine mill made a substantial production of lead concentrates in the latter months of 1943 and lead production should be further increased in 1944."

Manager R. D. Leisk describes this new discovery by saying that "by far the most important development of the year was the discovery on the 2,700 level of high grade lead and silver ore in the Chester vein and fault zone. This zone, which is structurally complex, is well to the north and east of the Sunshine vein system and has been prospected in the past by both Sunshine and Polaris Mining companies on higher levels with indifferent results. The new discovery was made in the course of exploration undertaken at the request of Polaris Mining Company and subsequent work has disclosed excellent ore at various points for 600 ft. on the strike and 750 ft. on the dip, with the full extent of the ore zone in both strike and dip still to be determined."

This is without doubt the most important ore discovery made in the Coeur d'Alene district since the original discovery of the great Bunker Hill mine. It not only adds to the present productive capacity of the district but it adds long life to the depth of the ore-bearing structures. The Chester vein opening at the Sunshine and Polaris is at a depth of about 80 ft. below sea level. First assays from the strike ran 74 percent lead and 174 ounces of silver. The first drift discovery work on the ore produced 817 tons of "muck" which was shipped direct to the Bunker Hill smelter as it came from the muck pile, without sorting or milling, and gave average smelter returns of 54.27 oz. of silver and 18 percent lead per ton, according to a report by the U. S. Bureau of Mines. The Bureau also reports that the Sunshine Company mined and treated 18,100 tons of lead-silver ore during 1943 from the new strike in the Chester vein which prevented a serious decrease in Idaho's lead output for the year.

» » » Eight large mining companies of the Coeur d'Alene district, Bunker Hill, Hecla, Sullivan, Federal, Sunshine, Polaris, Sherman, and Tamarack, paid the county, state and national governments over \$4,500,000 in taxes of all kinds during 1943. This is only a small portion of the

cash benefits accruing to the public from mining operations in this district. Arthur Campbell, state mine inspector, estimates that 7,000 men are employed in the mines of the district and that more than 50,000 other persons are directly or indirectly connected with and dependent on the mining industry for a livelihood.

» » » The Lucky Friday Silver-Lead Mines Company has opened a vein of commercial grade ore 16 ft. wide on the 800-ft. level in a shaft development enterprise at Mullan, Idaho. The vein developed a high grade streak 4 ft. wide which averaged 43.5 oz. of silver, 47.2 percent lead and 17.6 percent zinc. The balance of the vein averages from 10 to 20 oz. silver with small values in lead, zinc and copper.

» » » The Bradley Mining Company's gold, antimony, tungsten and quicksilver mines in the Yellow Pine district of Idaho, have been connected with civilization with the completion this month of a high tension electric power line which has cost the Idaho Power Company \$1,000,000. The line is 106 miles long and will carry 66,000 volts of electricity. Government and

state agencies are now building a modern highway into the district from McCall, Idaho.

WASHINGTON

» » » Washington mines in 1943 yielded gold, silver, copper, lead, and zinc valued (in terms of recovered metals) at \$7,989,720, compared with \$8,172,609 in 1942, a 2 percent decrease, according to the Salt Lake City office of the Bureau of Mines, U. S. Department of the Interior.

Among the more important features was the production of zinc throughout 1943 by the Howe Sound Co. from its copper ore body at the Holden mine, and the full year operation of the Knob Hill Mines, Inc., in the Republic district, Ferry County. To alleviate an acute labor shortage the Army furloughed over 100 miners to the copper mines in Chelan County and the zinc-lead mines in Pend Oreille County. This action tended to relieve the shortage somewhat. Additional men are to be obtained for the zinc and lead mines in the Metaline district of Pend Oreille County as soon as the Government-financed housing facilities at Metaline Falls and Metaline are completed.

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New Hard Hat

E. D. Bullard Company of San Francisco, Calif., announce a completely redesigned Hard Boiled Hat, known as the "Airlined" model.

Weight has been reduced to a little more than 12 ounces while impact resistance is increased through a new crown molding development.

Corrugations molded into the crown furnish the added strength, and at the same time give this hat an entirely new styling that has made an instant hit wherever it has been introduced. Exhaustive drop tests prove



the new style crown the most resilient of all Hard Boiled Hat models, and that the non-shattering feature is retained.

Greatest step in the development, however, is the new six-point hammock suspension, with adjustable size sweatband. It is necessary now to stock but one size to fit either men or women, thus simplifying ordering and issuing of protective hats.

The added comfort is a result of a flull-floating, self-adjusting sweatband that shapes to any head instantly after the hammock string is adjusted. No rigid part of the hat comes in contact with the head, so it is built truly on the floating suspension principle. An air space is always left between the hammock and the crown for ventilation, which makes this hat literally the "Airlined" model.

Fourth Army-Navy "E" to Philco, Storage Battery Division

In recognition of continued excellence in its war production record, the Storage Battery Division of Philco Corporation at Trenton, N. J., has just received its fourth Army-Navy "E" Award, it was announced recently by M. W. Heinritz, vice president in charge of the division, who was notified of the honor by Admiral C. C. Bloch, chairman of the Navy Board for Production Awards.

With all its production going directly, or indirectly to the war effort, the Philco Storage Battery Division is furnishing large quantities of batteries for the operation of the Water Buffalo type landing craft and PT boats, for use aboard the new Liberty ships for inter-communication and gun-firing, and for the 2,000-mile telephone line from Edmonton, Alberta, to Fairbanks, Alaska on the Alcan highway, as well as for essential telephone, electric power, railroad, mining, and industrial uses.

To date Philco Corporation has received 13 "E" Awards for its outstanding war production record, and the company's operations are at the highest level in its history.

A New Long-Life Stoker Timer Relay

A new primary stoker control—Thermo-Pilot—that utilizes the principle of thermal action has been developed by the Perfex Corporation, Milwaukee, Wis. It has now been tested in actual home installations through four heating seasons and is available for use.

It replaces the old conventional clock-timing mechanism and its complicated gear trains, ratchets, etc., with two simple moving units.

An electric current supplies heat energy to a bimetal element. When sufficient heat has been stored in this

element, a circuit is closed which energizes the stoker relay and places the stoker in operation. As the bimetal element cools, the relay is de-energized, stoker stops and cycle is repeated.

This hold-fire operation can be adjusted for short, medium or long operating periods at from one-half to one hour intervals to meet operating requirements. A special safety switch prevents hold-fire operations immediately after the stoker has been in operation at the command of the thermostat. There is no subsequent over-shooting of room temperatures.

Third Star Added to Army-Navy "E" at Barberlon Plant of B&W

The Navy Board for Production Awards has granted the Barberlon Plant of The Babcock & Wilcox Company a new Army-Navy "E" Pennant with three stars affixed. Announcement of the renewal was made on December 29 in a letter from Admiral C. C. Bloch to A. G. Pratt, president of B&W; the renewal dates from October 2, 1943.

The Navy "E" Flag was awarded to The Babcock & Wilcox Company in April, 1942; this was later changed to the Army-Navy "E", and renewals, for maintaining high standards of achievement, have been granted every six months.



One of the glass coal chutes at the Locust Coal Company's breaker at Shenandoah, Pa. On the left, the man is holding a section of Carrara glass used in the chute. On the right, a foreman holds a section of worn out steel plate. It was found that the steel chute had to be replaced about every three months due to eventual wearing through, caused by sulphur water and the abrasive action of the coal. After a year and a half the glass installation is still in use

Army-Navy "E" Renewal to the Bristol Company

The Bristol Company of Waterbury 91, Conn., manufacturers of industrial control instruments and mill supplies, recently received the first star for their Army-Navy "E" burgee, signifying renewal of the production award for the next six months.

Governor Raymond E. Baldwin visited The Bristol Company plant on March 6 for the purpose of congratulating the employees on the "E" renewal and also on the attainment of their Fourth War Loan quota.

New Carbide Tip Tools

Jessop Steel Company, Washington, Pa., announces MALTA Carbide Tipped Tools, a line of cemented carbides for cutting steel, cast iron, non-ferrous and non-metallic materials. The purpose for producing these tools is to round out the Jessop service to the metal working industry.

Jessop MALTA Carbide Tipped Tools are manufactured in ten different styles in a wide range of sizes and three grades of tips, MF for miscellaneous finishing, SF for steel finishing and CR for coarse roughing. The three grades are distinguished by colored shank ends: MF—red, SF—white and CR—blue, to insure

proper grade selection. The tools are rust-proofed to permit long storage safely.

Known as the "J. C." series, Jessop Carbide Tipped Tools are stocked both at the mill and in warehouses.

Celebrates 45 Years with Robins Conveyors

William P. Newman, purchasing agent of Robins Conveyors Inc., manufacturers of materials handling machinery, was honored at a luncheon held in the Passaic City Club, on the celebration of his 45th anniversary with that company.

Present at the gathering were 16 people who had spent a total of 400 years with Robins Conveyors. Besides Mr. Newman, those who had seen 30 or more years of service were, in order of precedence: Thomas Robins, 53 years; W. R. Browne, 39 years; E. S. Stadelman, 36 years; Messrs. E. C. Salzman, R. W. Eichenberger and T. M. Keith, 34 years each, and Thomas Matchett, 31 years.

In commemoration of the event, Mr. Robins presented to Mr. Newman a beautiful Gruen wrist watch inscribed: "Robins Conveyors Inc. to Wm. P. Newman—45 years of Loyalty, Integrity and Honor."

Mr. Matchett, president of Robins, acted as toastmaster.

Hazard Wire Rope and American Chain and Cable Honored



For efficiency and excellence of production of the Wilkes-Barre, Pa., plant of Hazard Wire Rope and American Cable divisions of American Chain & Cable Company, Inc., were awarded the Army-Navy "E" on January 20. Presentation of the award was made by Rear Admiral Wat T. Cluverius and it was accepted by George C. Gregson, Manager of Plants.

The "E" pins were presented by Major Howard P. Klair and were pinned on four representative employees by First Sergeant Harry D'Ortona, United States Marine Corps veteran. Patrick Shovlin accepted the pins on behalf of the employees. William T. Morris, president, American Chain & Cable Company, Inc., also spoke.

CATALOGS AND BULLETINS

AMPLIDYNE CONTROL. *General Electric Company, Schenectady, N. Y.* A 36-page bulletin G.E.A. 4053 describes the engineering details and fundamental functions of the amplydyne which in principle is an externally driven D.C. generator which uniquely uses a short circuit and a compensating winding. Included is a series of interesting diagrams, explanatory notes, etc., showing how this control is applied.

ANTHRACITE CONSERVATION. *Anthracite Industries, Inc., 101 Park Avenue, New York 17, N. Y.* Offers a folder "How to Conserve Anthracite and Improve Your Heating." Some of the helpful suggestions covered are: Starting the first fire of the season; checking the complete heating plant; care of grates, dampers and doors; checking for air leaks, etc.

CAP CRIMPER. *E. I. DuPont de Nemours & Company, Inc., Explosives Department, Wilmington, Del.* A little folder is offered showing the advantages and operation of the Superior Crimper of the new bench type which makes two smooth continuous internal beads on the throat of the cap grasping the covering of the fuse so closely a waterproof seal is made without the use of a waterproofing compound.

CIRCUIT BREAKERS. *I-T-E Circuit Breaker Co., 19th and Hamilton Streets, Philadelphia 30, Pa.* Catalog 1301 describes types KC, KB and KA circuit breakers for 250 volts d.c. and 600 volts a.c. manually or electrically operated, open and closed, or dead front mounting. General construction, mountings, protective devices, accessories and complete dimensions and diagrams are given for these products.

MERCURY-ARC RECTIFIERS. *General Electric Co., Schenectady, N. Y.* A new bulletin GEA-3706 completely describes Ignitron rectifiers. Their advantages of high efficiency, low maintenance, quick starting, ease of installation, etc., are discussed with many illustrations and diagrams of installations in various industries, including a number in the mining industry. Design, construction and operation is described with ample illustrations and diagrams.

NATIONAL FIRE CODES. *National Fire Protection Association, 60 Battery March Street, Boston 10, Mass.* *National Fire Codes for Flammable Liquids, Gases, Chemicals and Explosives, 1943* is an authoritative guide for preventing fires incident to the handling, storage and use of the above substances. It brings together the many standards dealing with these hazards and supersedes the *National Fire Codes on Flammable Liquids and Gases, 1938.* Pp 504.

PIPE & TUBE BENDING HANDBOOK. *Copper and Brass Research Association, 420 Lexington Avenue, New York 17, N. Y.* This book describes and illustrates many practical methods for bending pipe and tubes of copper, brass and related alloys. In addition it includes many data on chemical and physical properties of important pipe and tube alloys, definitions applicable to brass mill products, and numerous useful tables on weights of various types of tubes and rods.

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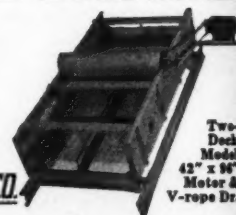
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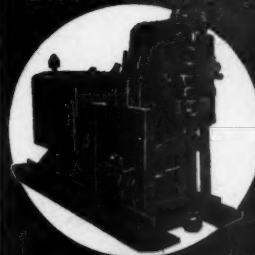
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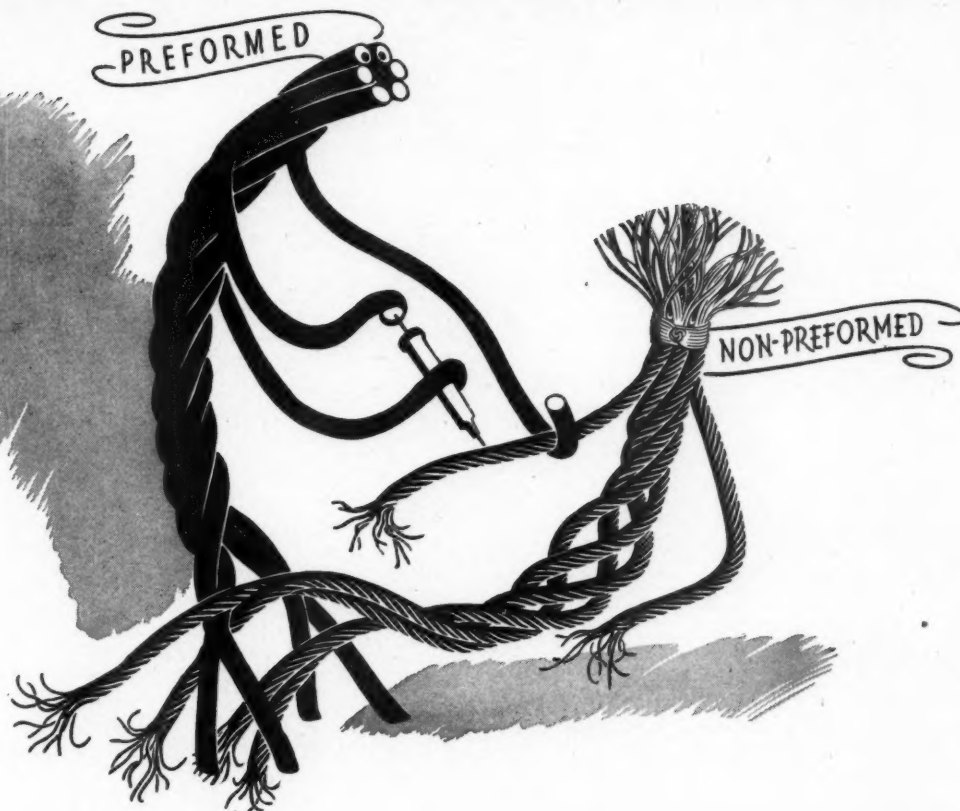
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